CORRESPONDENCE.

THE EAST RIVER BRIDGE.

EDITOR ENGINEERING NEWS:

BROOKLYN, Jan. 17, 1883.

I notice in your journal of the 13th inst, a very readable article by Mr. Rudolph Hering, on the East River bridge, which is commended editorially "as the most complete popular article on the subject yet presented to the public." Concurring entirely in the opinion thus expressed, I yet would beg leave to add something bearing upon the history of the inception of the work, which will detract nothing from the merit of Mr. Hering's paper, while affording some additional facts from the standpoint of one who can say: "All of which I saw, and part of which I was," and which I hope may not be without interest to your readers; the more particularly, as in reference to the professional names associated with the early stages of the work, it may be said, in the words of the Apostle to the Gentiles, "The greater part of whom remain to this day, though some of them be fallen asleep."

If what I have to offer on this subject should appear on its face as actuated by motives of a personal nature, you will, I trust, find in the circumstances of the case, an ample apology for a seeming self assertion, which is made in no spirit of detraction from what is deservedly due to more fortunate workers in the same field.

The East River Bridge, now approaching completion, may not be the greatest work of the kind which the world will ever see. It were unsafe to hazard such an assertion, in view of the past progress made in the mechanic arts since its inception, and the possibilities thence opened to the constructing engineer; but it is undeniably the boldest engineering work extant, and the time is not distant, let what may the whilst be the progress of engineering skill, when the benefits resulting from its success will be so evident and far-reaching in their effects, that individuals will not be wanting, who, now indifferent to the meed of praise due its earlier earnest supporters, will then be more than ready to cry out, "and ME TOO!"

Thirty years ago (Dec. 1852), Mr. Barkley, the President of the Lexington & Danville R. R., Ky., visited New York for the purpose of finding an engineer who would be willing to endorse the project of a suspension bridge for railroad travel over the Kentucky River, of 1,250 feet single span; the chasm to be crossed by that road being of that width, with almost vertical rocky cliffs, nearly 300 feet in height. As in those days a truss bridge on piers was out of the question, and Mr. J. A. Roebling had submitted a plan for a wire suspension bridge, at a cost presumably within the means of the R. R. Co., the President was desirous of obtaining professional advice, as to the feasibility and safety of such a scheme for railroad travel; and applying to Mr. Poor, then editor of the *R. R. Journal*, was referred by him to me.

After a proper study of the subject, I did not hesitate to pronounce the plan as entirely practicable and safe; upon which the President offered me, and I accepted, the position of Chief Engineer of that railroad. In justice to Mr. Roebling, I would state that, while I was the Chief Engineer of the road, and so far responsible for the works of construction, this responsibility did not extend to designing any part of the suspended structure, but simply to supervising its construction, under plans and specifications prepared and submitted by the contractor of the bridge, Mr. Roebling, and accepted by the Chief Engineer.

The work progressed to the completion of the four masonry towers, two on either side of the river, the anchorage tunnels in the cliffs, the completion of the anchorages, and the preparation of materials for the cables, when embarrassment in the finances of the railroad company, growing out of derangement in the monetary affairs of the country, put a stop to the work.*

*The bridge at this site has since been completed (1878) by C. Shaler Smith, as a truss bridge of three spans, of about 400 ft. each, with two piers of 276 ft. in height. The masonry towers playing an important part in the erection of the trusses.

I introduce the above, preliminary to anything in reference to the East river bridge, partly to show the professional relations subsisting between the writer and Mr. Roebling, in the practice of the latter as a suspension bridge builder, years previous to his connection with the East River bridge, and the *possibility* (which may be fairly inferred) that a long span suspension bridge for railroad travel was an idea common to both of us, and by no means exclusively the property of either one—and chiefly to acknowledge the opportunities which this connection afforded me of becoming acquainted with a practical branch of the profession, hitherto regarded somewhat as a specialty, and to which Mr. R. had, in connection with his manufactory of wire at Trenton, directed much of his time and acquired a deservedly high reputation.

In 1866-7, during some city improvements in Brooklyn, I was brought in contact with Mr. Wm. C. Kingsley, then a successful contractor of large experience, and accustomed to meet and overcome difficulties in the way of his enterprises; and while I cannot say that it was through his suggestion, but it certainly was through the encouragement received from him, that I prepared plans in detail for a suspension bridge between the two cities of New York and Brooklyn, and which were exhibited during the whole time of the fair of the American Institute in New York in 1866.

The matter was taken up by Mr. Kingsley with great earnestness and enthusiasm, and Senator H. C. Murphy and others being brought in, the result was the procuring of a suspension bridge charter from the Legislature, bearing date April 16, 1867.

A point of disagreement with Mr. Hering, lies in the statement made by him, that "the originator of the scheme was J. A. Roebling," whereas it will presently be shown that, if Mr. Roebling originated the scheme, it was not communicated to the gentlemen who were earnestly endeavoring to obtain an act of the Legislature authorizing its construction. They were entirely without any such aid as might be afforded by detailed plans of Mr. Roebling. They were ignorant of the existance of any such plans, if indeed they then existed in such tangible shape as to admit of presentation before the Legislature. The managers in their operations at Albany, had photographic copies of the general plan of the undersigned previously referred to, framed and presented to members of the Legislature, *as illustrating the scheme in general for which their votes were solicited*; and under these auspices the charter was obtained.

It is scarcely to be doubted, that Mr. Roebling had in his own mind, perfected a plan in general for this bridge—possibly years previously, and may have elaborated it on paper, and he may have had interviews with individuals prior to the passage of the act, who ultimately became directors under the charter, and to whom he had expressed his opinions as to the entire feasibility of such a scheme, but—and this is the point which I would emphasize, quoting from the Brooklyn Union of Oct. 7th, 1867:

"It is well known, that my plans in detail, including the selection of the proper location of the bridge, first secured the attention of the public, and demonstrated in a somewhat tangible form, what had until then but existed in the minds of men as a *possibility*—scouted at even by professional men as, 'a castle in the air,' without practical value, until after years of discussion and argument, I find my labors so far rewarded, as to meet with few now who doubt its entire practicability, and the only remaining difficulty to be overcome is the one of—*dollars*."

And in support of this, I quote from the following public documents. When, during the progress of the work, the question first arose as to the management of the bridge, the public mind much exercised thereby, an elaborate report was made by the various officers of the Bridge Co., which appeared in the Brooklyn *Eagle* of Jan'y 7, 1873. A quotation from the report of the Executive Committee, reads as follows:

"The project of building a bridge across the East River, although for many years the subject of more or less public discussion, was not seriously taken up, until six or seven years ago, when Colonel Adams, through the instrumentality of Mr. Kingsley, projected a plan for a suspension bridge. Afterwards, through the same means, the late John A. Roebling submitted another plan, which was the one finally adopted."

This report is signed by S. L. Husted, J. S. T. Stranahan, H. W. Slocum and H. C. Murphy.

Subsequently, an investigating committee of the Common Council of Brooklyn, was appointed to take testimony on this subject, and as appears by the report published in the *Eagle*, April 5, 1873, the first witness called was William C. Kingsley, then, and from its commencement, the Superintendent of the bridge, and at present, the Vice-President, and since Senator Murphy's death, the acting President of the Board of Trustees, and unquestionably, the man, through whose indomitable energy, and far-sightedness, we are measureably indebted, for giving tangible shape and substance, to what might otherwise long have continued, but as shadowy possibilities.

Extracts from Mr. Kingsley's testimony.

"In the summer of 1866, I met Col. Adams, in connection with the subject of bridging the East River, * * found that he had given the matter a deal of attention, and at considerable pains had plans made for a bridge across the East River; with him I examined these plans very carefully; * * * became thoroughly impressed with the feasability of building the bridge; * * * brought the matter to the attention of Senator Murphy and others; * * * Mr. Stranahan and Judge McCue; * * * brought these gentlemen in communication with Col. Adams, who explained the matter to them, as he had done to me; * * * we determined to apply for a charter; * * * and during that session (winter and spring of 1867) a charter was presented to the Legislature, and was passed, *based upon the plans made by Col. Adams.*"

"Subsequently, the company finding itself clothed with great power and responsibilities; * * * the matter was considered of appointing an Engineer; * * * they felt it their duty to employ a man who had built such a bridge, and that was John A. Roebling, who up to that time, had never been in communication with our Company, and after the passage of the bill, etc. etc., the position was offered to Mr. Roebling who accepted it."

There is still another point to be noted. In Mr. Hering's list of the engineers, whose opinions were solicited by the directors, prior to the commencement of the work, as to the feasibility of the undertaking, omissions of small moment to the public occur, but their correction in this connection is not without value, and a corrected list is added from Mr. Kingsley's testimony, as follows:

"The company felt it to be their duty to fortify the opinion of Mr. J. A. Roebling, by calling to his aid six or seven of the best engineers of the country; * * * to report upon the plans to the company. They were Horatio Allen, Mr. Latrobe, Mr. Steele, Colonel Adams, Mr. Kirkwood, Mr. Serrel, and Mr. McAlpine, who, with Mr. Roebling, spent five or six weeks in the examination of plans, * * * then visited the suspension bridges built by Mr. Roebling, and reported unanimously in approval of the plan proposed by him in April, 1869."

The above testimony may be regarded as conclusive.

The publication in a journal of so wide circulation among professional men as ENGINEERING NEWS, of a history of the early days of the East River bridge, without so much as the name of the the undersigned appearing in any connection, will be considered, it is hoped, as ample provocation for whatever of uninteresting personal matters may have been inflicted upon your readers by

J. W. ADAMS, Consulting Engineer,
155 Congress street, Brooklyn.

THE LONGEST TANGENT.

GREENSBORO, N. C., Jan. 4, 1883.

EDITOR ENGINEERING NEWS:

In your issue of Dec. 9, 1882, the undersigned asked to be informed as to "the longest tangent on an operating railroad, both in this country and Europe and the name of the road."

Only two responses, so far, noticed. One from "L. M. H." of the University of Pennsylvania, giving two tangents—32 and 60 miles in length—the former on the Camden and Atlantic R. R., in New Jersey, and the latter on the Northern Pacific from Fargo West through Dakota. Mr. John E. Blunt, engineer, gives a tangent on the Dakota Div., of the Chicago & Northwestern Railway of 54 miles long.

On the old Wilmington, Charlotte and Ruther,

ford Railroads, now the Carolina Central, the undersigned, as principal assistant under the late chief engineer, John C. McRea of Wilmington, N. C., located a tangent between Wilmington and Charlotte of 78 miles in length. At the eastern end of this tangent there is a deflection, to avoid a swelling and to obtain a suitable crossing of Livingston Creek of 1° 20′ turned off with a 20′ curve when the line is straight again for several miles. The entire distance between Wilmington and Charlotte is 188 miles, and 95 per cent of it is straight line. The road is built on the location.

ROGER B. ATKINSON, C. E.

LIFE OF CAST-IRON PIPES.

NEW YORK, Jan. 12, 1883.

EDITOR ENGINEERING NEWS:

DEAR SIR: In connection with the valuable service which Mr. Croes is rendering through your columns to our water supply records, it would be of great professional service if a record could be made of the experience which is obtained in the ordinary contingencies of the works, as to the stability of reservoir banks and lining, nature and effects of wave wash, periods of fermentation, use of surface supply, action of filter beds, freezing of mains and hydrants; ruptures of mains, their rate of oxidation and tuberculation, and the comparative results with Nos. 1, 2, 3, 4, etc., pig iron, green sand and loose molds, horizontal and vertical castings, etc.

If any of your readers can furnish notes of the comparative exposure and durability of gas and water mains, they would be of great service in a direction where our text-book literature signally fails. NASSAU.

THE PHILADELPHIA WATER DEPARTMENT.

ENGINEERS' CLUB OF PHILADELPHIA,
ROOMS NO. 1523 CHESTNUT ST.,
PHILADELPHIA, PA., Jan. 16, 1883.

EDITOR ENGINEERING NEWS:

In your issue of Dec. 9, 1882, under the heading of "The Philadelphia Water Department," we were greatly surprised to find a statement that a certain letter, written by the secretary, (but not, by the way, in his official capacity) had "led to a little ripple of excitement at the meeting of the club on last Saturday evening, and the outcome was the following resolution: Whereas, &c., &c."

The article was brought to the attention of the Club on Saturday evening, its first business meeting since that date, and the secretary was directed to inform you that no such preamble or resolutions had been, at that or any other time, passed or put to vote by this Club. As it is evident that whoever furnished you with the "Resolutions" in question, did so with a view of placing the club in a false position, and as this is more likely to have been accomplished by their prominent place among your editorials, will you not make correction by printing this letter in the same position in this week's paper?

Respectfully yours,
HOWARD MURPHY, Secy. and Treasurer.

P. S.—As reference was made to the secretary in the article, he would like to state that his official and personal business are entirely distinct; that he proposes to conduct the latter according to the dictates of his personal judgment, and that it is neither the right or disposition of the club to interfere therewith in any way whatever. H. M.

[We did not invent the Resolution, and have no reason to suppose that our correspondent did. We understood that such a Resolution was offered, was discussed, was modified, and was finally withdrawn upon certain conditions.—ED. ENG. NEWS.]

EARLY BOOKS ON SURVEYING.

UNIVERSITY OF PENNA., PHILA., Jan. 12.

EDITOR ENGINEERING NEWS:

Speaking of *old* works on surveying, I find in our Roger's Engineering Library a much more antiquated specimen than that referred to in your last issue. It is entitled "The Compleat Surveyor, containing the whole Art of Surveying of Land by the Plain Table, Theodolite, Circumferentor and Peractoe. After a more easie, exact and compendious manner, then hath been hitherto published by any: the PLAIN TABLE being so contrived, that it alone will conveniently perform whatsoever may be done by any of the fore-mentioned *Instruments*, or any other yet invented, with the same ease and exactness; and in many cases much better together with the taking of all manner of heights and distances," &c. &c. * *

"Hereunto is added, the manner how to know whether water may be conveyed from a Spring head to any appointed place or not, and how to effect the same, with whatever else is necessary to the Art of Surveying. By William Leybourn—London. Printed by R. & W. Leybourn for E. Brewster and G. Sawbridge, and are to be sold at the signe of the Bible upon Ludgate hill, near Fleet-bridge. M. D. C. LIII. On the first page is a Vera Effigies; Gulielmi Leybourn — Philom. anno Ætates, 27."

It is an 8vo of 297 pp. bound in sheep. Numerous blank leaves are inserted for problems, but those containing names of owners in front of title have been removed. On title page is written the name Sam'l Whyte.

The work is dedicated "To his much honored friend Edmund Wingate, of Grayes Inne, Esq."

Very truly yours,
L. M. HAUPT.

THE NICKEL PLATE RAILROAD.

ERIE, Pa., Jan. 15, 1883.

EDITOR ENGINEERING NEWS:

In the papers published between Buffalo and Chicago articles lauding the new railway between these points have appeared almost without interruption since the survey was commenced.

These are now supplemented with a paragraph, over the signature of Professor Robinson, Ohio State Railway Commissioner, by which it appears that he has recently been over the line. This paragraph is to have the weight of official influence to bring patronage to the line; I can therefore no longer be silent in relation to its radical defects.

As applied, the term "Nickel Plate" is a misnomer; in reality, *snide* would be a fitting appellation, from its inception to date. It is a well-known fact that, as a whole, the masonry is the poorest possible. In places the horizontal joints are three inches in depth, but the defects of poor mortar have been hidden by a liberal use of Portland cement to retain in place the mortar rattling out by the vibrations caused by trains passing over the viaducts, and where the work could not stand alone it has been rebuilt.

In other places washed by the rapid streams the slight pedestals, surmounted by bridge spans from 75 to 100 ft. high, have no foundations, and the most slimpsy protection has been extemporized, which is liable to be washed out in half an hour. In many places these lofty struts stand away to one side the center of the pedestals, and these only four feet square, on stone caps, on which the last season's frost shows its laminating action.

From Painsville to Brockton it would be difficult to find a single piece of masonry which has not been disfigured by cutting, to get the bridges into place, or which has not been torn down and patched or doctored with Portland cement.

The "*parapet*" culverts are a feature of this railway, so-called because outside the embankment in sight, the timber covers are six inches thick, but out of sight, where the weight of even ten feet of embankment comes on the cover only a fraction of this thickness.

In regard to the viaducts reported to be models of strength and beauty hereafter to be copied, it is unnecessary to observe they are but faulty imitations of structures in use for years. Built without proper inspection, and cobbled up with plates of all thicknesses, their tensile members made of iron of the poorest quality, with plate iron joinings already half cracked off, but filled with paint. Constructed without regard to expansion, they have been strained beyond the limit of safety, cut, drilled and broken to stand up to be sold to the highest bidder. These are some of the worst features. When the day of doom comes to a passing train and it plunges 100 ft. into an abyss, we shall not wonder at the cause. Respectfully,

GEORGE L. MOODY,
City Engineer, Erie, Pa.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 21.)

CCCCLX.—PETERBOROUGH, ONT.

Peterborough, Ontario, Canada, in lat. 44° 20′ N., lat. 78° 24′ W., on the Otonabee River, is on hilly ground. The river falls 50 ft. in passing through the town, and is dammed in five places, affording valuable water-powers.

Water-works were built by a private company in 1882, after plans of Robert Surtees, C. E., and under superintendence of J. E. Belcher, C. E., taking the supply from the river and pumping directly into the mains. Two 33-in. Little Giant water wheels, under 12 ft. head and fall, drive two Knowles pumps of 14-in. cylinders, with 16-in. stroke, pumping against 150 lbs. pressure.

The water is taken from above the dam and passed through charcoal and gravel screens in a filtering chamber.

Distribution is by four miles of cast-iron pipe, of from 12 to 5 in. diameter, made in Glasgow. There are 6 fire hydrants, 10 gates and 20 taps. The fire hydrants are for private fire protection, the town authorities preferring old-fashioned arrangements. Service pipes are of lead.

The population is 6,812. The works, which went into operation in December, 1882, have cost $60,000.

George W. Hatton is the Secretary and Treasurer.

CCCCLXI.—COCHITUATE, MASS.

Cochituate, in the town of Wayland, Middlesex Co., Massachusetts, in lat. 42° 20′ N., long. 71° 20′ W., is on rolling ground.

It was incorporated in 1835. Water-works were built by the town in 1878 after plans of Hiram W. Blaisdell, taking the supply from Snake Brook, a tributary of Lake Cochituate, which drains a water shed of two-thirds of a square mile. An earth dam 130 ft. long and 30 ft. high, with a heart wall of rubble masonry, 3 ft. thick at bottom and 22 in. at top, create an impounding reservoir of 13 acres area, which holds 16,000,00 gallons at 68 ft. above the village.

A filter gallery was formed by excavating a trench along the bank of the reservoir for 400 ft. The bottom is from 10 to 6 feet below high-water level, and there are two branches, each 80 ft. long, extending under the reservoir. In this trench was laid a dry stone culvert 18 in. high and 12 in. wide, over which the trench was backfilled. This gallery terminates in a well 6 ft. in diameter, 200 ft. above the dam. From the well, 227 ft. of 10-in. cast-iron pipe lead to a chamber below the dam. An 18-in. pipe leads through the dam, with a branch to a 30-in. turbine wheel which drives a rotary pump for fire pressure. The ordinary supply is from the filter gallery, but in case of fire it is drawn directly from the pond and pumped into the supply main, which is of 10-in. diameter, and a mile long. There has been some trouble with the water furnished from this gallery, on account of the presence of a vegetable growth which made an ochreous deposit in the pipes.

Distribution is by 6 miles of cast-iron pipe of from 8 to 4 in. diameter, with 32 fire hydrants, 11 gates and 120 taps. The town pays $12 per year for each fire hydrant. Service pipes are of wrought-iron, tarred.

The population in 1880 was 1,161. The daily consumption is not known.

The works cost $29,000, which is the amount of bonded debt at 5 per cent. interest.

The expenses in 1881 were $300, and the receipts $1,737. The works are managed by three commissioners. Ralph Bent is the superintendent.

CCCCLXII—GUELPH, ONT.

Guelph, Ontario, Canada, in lat. 43° 30′ N. long. 80° 13′ 15″ W. on the Riper Speed, is on undulating ground rising from the river to a height of 130 ft.

Settled in 1827, it was incorporated as a city in 1879. Water-works were built by the city in 1879 after plans of F. W. Cooper and Thomas Inglis, taking the supply from the ground water near the bank of the Eramosa branch of the river speed. A T-shaped basin was excavated to 10 ft. below the river surface, through gravel and clay which is saturated with water. A 30-in. brick conduit connects this basin with the river, and is so arranged that the pumps can draw from either the river or the basin. About 250 ft. from this basin, in which copious springs flow, another basin is excavated in the gravel, into which water from the river can be pumped, with the intention of having it filter through the intervening gravel into the service basin. The pump well adjoins the service basin. Two horizontal pumping engines built by Inglis & Hunter with 14 in. steam and 7 in. water cylinders of 22 in. stroke pump directly into the mains. The ordinary pressure at the pumps is 85 lbs. and the fire pressure 100 to 120 lbs. Distribution is by 18 miles of cast-iron

pipe, of from 12 to 4 in diameter, with 101 fire hydrants, 58 gates and 266 taps. There are 4 meters. The city contributes $20 per year for each hydrant. Service pipes are of lead.

The population in 1881 was 9,890 and the daily consumption 214,000 gallons.

The works cost $108,000. The bonded debt is $100,000, at 6 per cent. interest. The expenses in 1882 were $4,387 and the receipts $7,092.

The works are managed by three commissioners. George Howard is the Chairman and E. Harvey Secretary.

CCCCLXIII.—FARGO, DAK.

Fargo, Dakota Territory, in lat. 46° 55′ N. long. 96° 50′ W. on the Red River of the North, is on a level prairie, 32 ft. above low water in the river and 4 ft. above the high water of 1882. It is 917 ft. above sea level. Settled in 1873, it was incorporated a city in 1875. Water-works were built by a private company in 1880, taking the supply from the Red River, above the business part of the city, and pumping directly into the mains by a Holly quadruplet engine, with pumps of 8 in. bore and 22 in. stroke. The ordinary pressure is 30 lbs. and the fire pressure 100 lbs. The water is passed through a settling basin before reaching the pumps.

Distribution is by 6¼ miles of cast-iron pipe, with 48 fire hydrants, 25 gates and 206 taps. There are 7 meters in use. The city pays $100 per year for each fire hydrant. Service pipes are of lead generally, with some iron.

The population in 1880 was 2,693. In Nov., 1882, it is reported as 7,000. The daily consumption in 1882 was 200,193 gallons.

The capital stock of the company is $75,000. The works have cost $65,143. The bonded debt is $50,000 at 7 per cent. The receipts to Dec., 1882, were $16,777.

Charles Sweatt is the President and Treasurer, and W. B. Douglas, Secretary.

CCCCLXIV.—TOPEKA, KAN.

Topeka, Kansas, in lat. 39° N., 95° 30′ W., on the Kansas River, is on an undulating prairie. Settled in 1856, it was incorporated a city in 1857. Water-works were built in 1882 for a private company by Russell & Alexander, taking the supply from the ground water under the bed of the Kansas River. A well 75 ft. in diameter with cemented wall and open bottom, is sunk in porous gravel on an island in the river 80 ft. from the water and to a depth of 7 ft. below the river bottom. The suction pipe of the pumps leads from the well to the engine house near the river bank. The water is pumped directly into the mains with 65 lbs. ordinary and 130 lbs. fire pressure, by two Holly quadruplex pumping engines.

Distribution is by 15 miles of cast-iron pipe of from 16 to 4-in. diameter, with 152 fire hydrants and 360 taps. There are 4 meters in use. The city pays $46.66 each for 150 fire hydrants and $50 for each additional one, per year. Lead and iron service pipes are used.

The population in 1880 was 15,142. The daily consumption is not given. The capital stock of the company is $200,000. The works have cost $162,000. The bonded debt is $120,000 at 7 per cent. The works went into operation on July, 1882. Byron Roberts is the Secretary and Robert Wood the Superintendent.

CCCCLXV.—LUDINGTON, MICH.

Ludington, Michigan, in lat. 43° 56′ N., long. 86° 23′ W., is on Pere Marquette Lake and River and Lake Michigan.

Settled in 1867, it was incorporated a city in 1873. Water-works were built in 1882 for a private company by M. Walker, taking the supply from Pere Marquette River, and pumping directly into the mains by two Walker pumps of 7 in. bore and 14 in. stroke; with ordinary pressure 40 lbs. and fire pressure 100 lbs. The present supply is considered as temporary only, as it is expected that water for domestic use can be procured by bored wells.

Distribution is by 4½ miles of Wyckoff wooden pipe of from 10 to 4 in diameter, with 40 fire hydrants, 15 gates and 60 taps. The city pays for the use of the fire hydrants and 3 watering troughs. Service pipes of lead and of iron are used.

The population in 1880 was 4,190. The present daily consumption is 50,000 gallons.

The works have cost $30,000. The annual expenses of operation are $2,600 and the revenue $4,000. The works have been in operation since July 1, 1882. N. J. Gaylord is the superintendent.

CCCCLXVI—SPENCER, MASS.

Spencer, Massachuseetts, in lat 42° 13′ N., long. 72° 00′ W., on Seven Mile River, is on very broken ground.

Settled in 1686, it was incorporated a town in 1753. Water-works were built by a private company in 1882, after plans of Simpson C. Heald, taking the supply from Shaw's Pond, 2½ miles from and about 200 ft. above the village A small dam creates a pond of 67 acres area, with about ¾ square mile water shed. The water is conveyed to the village through 13,300 ft. of 14-in., cement-lined, wrought-iron pipe. Distribution is by 5 miles of cement-lined wrought-iron pipe of from 10 to 4 in. diameter, with 30 fire hydrants. The number of taps can not be given yet. The town pays $50 per year for each fire hydrant. Service pipes are of wrought-iron.

The population in 1880 was 7,466. The works have just been completed.

The capital stock of the company is $200,000. The works have cost $120,000.

Luther Hill is the President, and C. L. Goodhue the General Manager.

CCCCLXVII.—NORTHBOROUGH, MASS.

Northborough, Massachusetts, in lat. 42° 21′ N., long. 71° 38′ W., on the Assabet River, is on nearly level ground, surrounded by hills.

It was settled about 1680.

Water-works were built by the town in 1882, after plans of Percy M. Blake, C. E, taking the supply from the west branch of Cold Harbor Brook, 3 miles from the village and averaging 180 ft. above it.

An earth dam 650 ft. long and 20 ft. high, with a heart wall of cemented rubble masonry, creates a pond of 12 acres' area, and 2½ square miles watershed, and containing 50,000,000 gallons.

The conduit to the village is of 10 in. wrought-iron cement-lined pipe.

Distribution is by 4 miles of similar pipe of from 8 to 4 in. diameter, with 40 fire hydrants, 48 gates and 100 taps. Service pipes are of enameled wrought iron.

The population in 1880 was 1,676.

The works have cost $52,000. The bonded debt is $50,000, at 4 per cent. interest.

The works are managed by three water commissioners. Cyrus Pattee is the President and Samuel Wood Treasurer.

CCCCLXVIII.—ONEONTA, NEW YORK.

Oneonta, New York, in lat. 42° 27′ N., long. 75° 03′ W, is on hilly ground on Oneonta Creek.

Water-works were built by a private company in 1882, after plans of W. B. Rider, C. E., taking the supply from a small stream with a water-shed of 8 square miles. An earth dam, with a stone heart wall, 150 ft. long and 30 ft. high, forms a storage reservoir of 7 acres area, holding 22,000,000 gallons at 180 ft. above the main street of the village. In the outlet chamber of the dam is a filter of sponge and charcoal. The conduit to the village is of 16, 12 and 10 in. cast-iron pipe.

Distribution is by 5½ miles of 10 to 4 in. cast-iron pipe, and a little 1½ in. wrought-iron pipe.

There are forty fire hydrants and 130 taps.

The village pays $750 per year for 35 hydrants, and a railroad company pays for 5. Service pipes are of lead and wrought-iron. The population in 1880 was 3,002. The daily consumption is not known.

The capital stock of the company is $40,000. The works have cost $47,000. The debt is $6,000 at 6 per cent. The works went into operation in October, 1882. George J. Wilber is the Vice-President and S. A. Norton the Superintendent.

CCCCLXIX.—FREEPORT, ILL.

Freeport, Illinois, in lat. 42° 17′ N., long. 89° 37′ W., is on a bluff, from 70 to 110 ft. above the Pekatonica River. It was settled in 1835.

Water-works were built in 1882, by Nathan Shelton, under a contract with the city, granting him the privilege of supply water for 30 years. This franchise is now held by a company. The works were built after plans of J. D. Cook, C. E. The supply is taken from a well 25 ft. in diameter and 28 ft. deep, in porous gravel, near the bank of the Pekatonica River, and is pumped by two Knowles' duplex steam pumps, one with compound condensing engines, the other with high pressure engines, each of 1,700,000 gallons daily capacity, pumping into a plate-iron stand pipe of 15 ft. diameter and 88 ft. high, on ground 107 ft. above the river.

Distribution is by 9 miles of cast-iron pipe of from 16 to 4 in. diameter, with 84 fire hydrants and 67 gates. The city pays $50 per year for each hydrant. The works went into operation in December, 1882. No financial statistics are given.

T. R. Sylvanus is secretary and treasurer, and W. H. Stratton the superintendent.

CCCCLXX.—WALLINGFORD, CONN.

Wallingford, Connecticut, in lat. 41° 33′ N., long. 73° 14′ W., is on hilly ground on the Quinnipiac River.

It was purchased from the Indians in 1638, laid out as a village in 1673 and incorporated a borough in 1868.

Water-works were built by the borough in 1882, after plans of D. C. Sanford, C. E., and under superintendence of John Osborne, C. E., taking the supply from Lake Pistapang, 4½ miles from and 245 ft. above the center of the borough, and 315 to 330 ft. above the manufacturing portion of the town. The area of the lake is 136 acres, and its water shed about half a square mile. The drainage of about three-quarters of a square mile additional can be diverted to the lake. From a point in the lake at 11 ft, below its surface, an 18-in. conduit of stoneware pipe conducts the water 800 ft. to the gate chamber, from which a cast-iron pipe of 12 in , reduced to 10 and 8 in. diameter, leads to the borough. For 1,000 ft. at a summit, it is in a tunnel, 30 ft. below the surface.

Distribution is by seven miles of cast-iron pipe of from 8 to 4 in. diameter, with 53 fire-hydrants, and 40 gates.

Water was introduced on Dec. 16, 1882.

The works have cost $80,000. The bonded debt is $75,000 at 6 per cent.

The population in 1880 was 3,017.

The works are managed by three commissioners, one being elected each year. B. F. Harrison is the chairman.

TO BE CONTINUED.

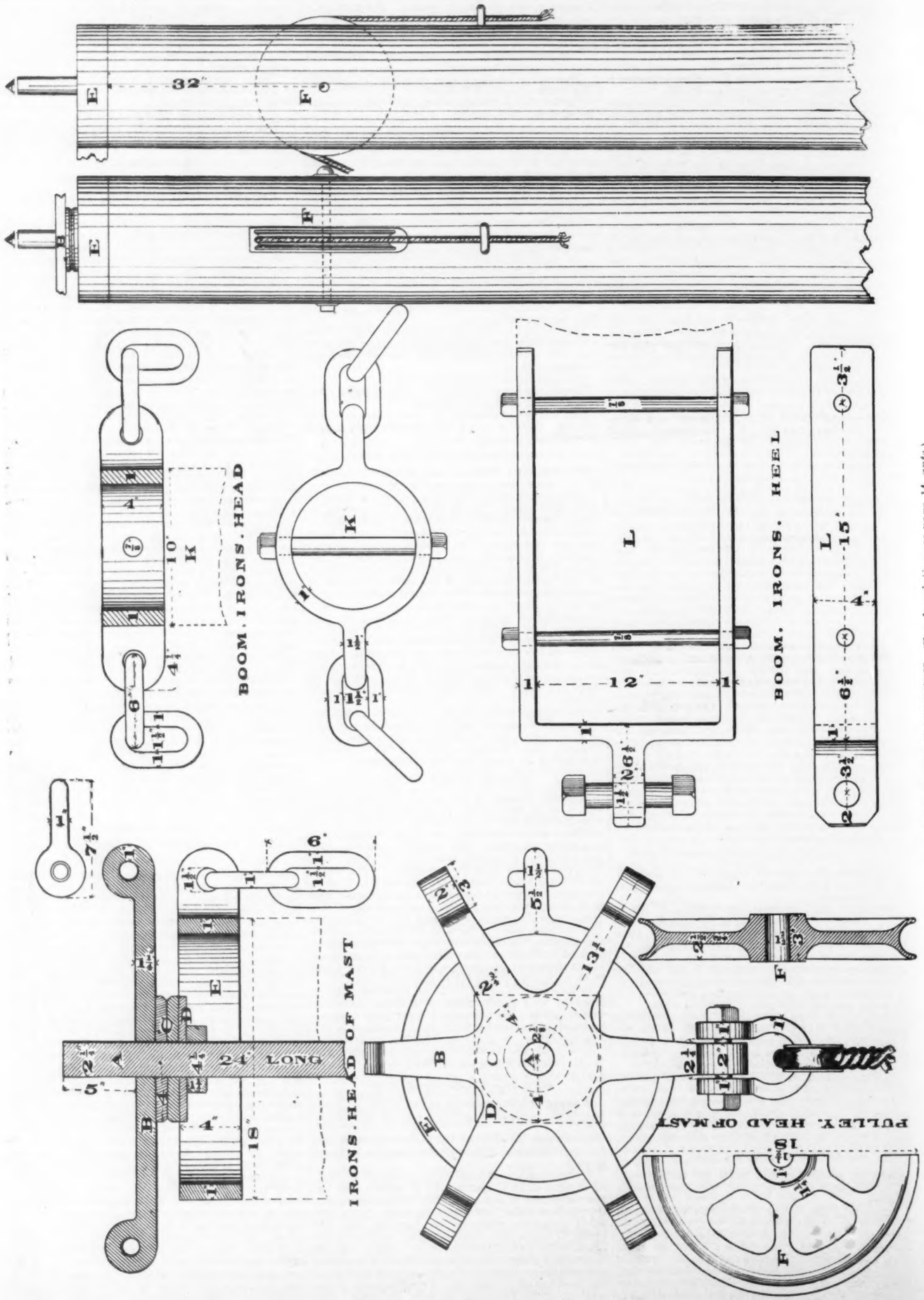
STRAW AS A SUBSTITUTE FOR WOOD.

The invention by which straw is used as a substitute for timber is an American one, and if the material fulfills all that is prophesied of it, it will probably interfere considerably with the timber trade. The following account has been published in America of this new substitute for wood. The straw timber is said to be adapted to many kinds of finishing work, panels, counter and table tops, fine doors and ornamental work, and it is said that it can be produced and sold in competition with the finer grades of pine or wide walnut, at about one-half the price of the latter. The standard manufactured is in widths of 32 in., a length of 12 ft., and a thickness corresponding to surface boards. These dimensions may be varied to suit such orders as may be given, and embrace any width, length or thickness. Unlike lumber, however, narrower widths are the most costly. The straw lumber may be ripped with the hand saw, or upon the buzz saw; may be run through the sticker for the manufacture of moldings, and takes a nail or screw as well as oak. It is practically water and fire proof, being manufactured under 500° of heat, and it is stated to have stood boiling some hours without any apparent change of structure. Its tensile strength is greater than that of walnut or oak, and its weight about one-fifth greater than that of the former when dry. It is made from any kind of straw, including hemp and flax fiber; in fact, from any material that will make pulp, and a ton of straw will produce 1,000 ft. of boards. The pulp is rolled into thin sheets, a number of which, corresponding with the thickness of the lumber desired, are placed together with a peculiar cement, which is claimed to be waterproof, and are then rolled under a pressure sufficient to amalgamate them into a solid mass, which may be worked with a plane if desired.

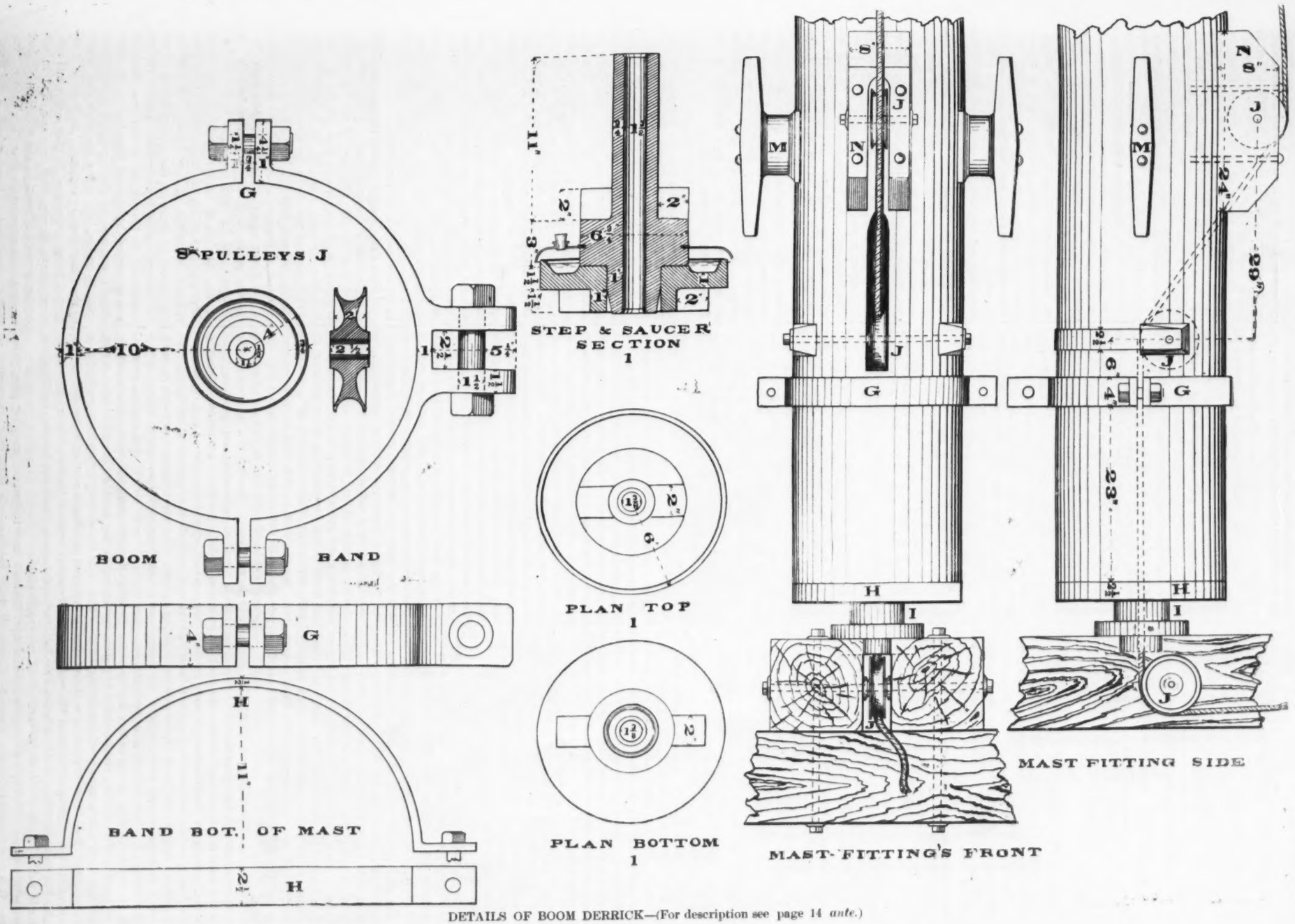
When it is remembered that it takes 100 years to grow a tree to maturity, suiting it for commercial purposes, and a tree producing 32 in. lumber will require fully twice that time, while 20,000 ft. per acre is a large yield under the most favorable circumstances, it will at once be realized that where 2,000 ft. can be taken from an acre of ground for an indefinite number of years, the process which enables such a result to be accomplished, and which will yield a really valuable lumber, should be one of great importance.—*Journal of the Society of Arts.*

RAILROADS IN FRANCE.

M. Ribot, the reporter of the Budget Committee, has drawn up a report on the situation of the Public Works estimates, which will be distributed in the course of a week. M. Ribot states that the Freycinet railway scheme at the present moment stands thus—there are 3,600 kilometres completed, 5,200 in course of construction, 4,100 sanctioned as likely to be of public utility, but not in course of construction, and 4,400 simply proposed, but not yet sanctioned. Of these different classes, the completed lines and those in course of construction have thus far cost together 1,490,000,000f. The expenditure still necessary to complete the scheme is as follows: One hundred and seventy million francs for the lines already opened, 1,170,000,000f. for those in course of construction, 860,000,000f. for those sanctioned as of public utility, and 1,525,000,000f. for those proposed, but not yet sanctioned; total 3,725,000,000f. Thus the entire outlay, past and future, upon the railways required for the completion of the Freycinet railway programme is 5,215,000,000f. Add to this sum 2,025,000,000f. for the improvement and construction of ports, canals and navigable channels, and the grand total is brought up to 7,240,000,000f. There is a discrepancy of nearly 2,000,000f. between this total and that given by the ministers of Public Works and Finance. This, however, is simply due to the ministers having comprised in their estimate a number of lines not yet officially proposed. M. Ribot further states that the Minister of Public Works has informed the Budget Committee that he will confine himself next year to the completion of the lines in course of construction, and that he would strive to reduce the outlay in proportion as those in course of construction were completed.—*Paris Dispatch to the London Times.*



DETAILS OF BOOM DERRICK.—(For description see page 14, *ante*.)



DETAILS OF BOOM DERRICK—(For description see page 14 *ante.*)

ENGINEERING NEWS
AND
AMERICAN CONTRACT JOURNAL.

Tribune Building, New York City.

The Engineering News Publishing Company, Proprietor.
GEO. H. FROST, Treasurer.

SATURDAY, JANUARY 20, 1883.

EDITORIAL ANNOUNCEMENTS.

Terms of Subscription.—To the United States and Canada, $4 per annum, including postage; all parts of Europe and Mexico, $5, payable in advance. Remittances at the risk of the subscriber, unless made by registered letter or by draft, check or P. O. order, payable to GEO. H. FROST.

Terms of Advertising.—One inch, 12 lines, one insertion, $2; one month, $6.50; three months, $17; six months $30; one year, $50. Special rate for large space and long time will be given on application. Advertisements inserted for less than three months, payable in advance; for longer time, payable quarterly.

Articles for Publication in the current number should be received at the office of publication not later than Thursday morning, and advertisements not later than Friday noon.

Correspondence upon subjects which naturally belong to the province of this journal is solicited.

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PUBLISHERS' DEPARTMENT.—For information concerning mailing of books, papers, etc., and in answer to questions relating especially to business matters see Publishers' Department on page III of advertising.

SAW FILING.—John Wiley & Sons have just issued a compact, well-printed little work, entitled "Saw Filing"—a practical treatise, in popular form. The author is Robert Grimshaw, an authority upon the subject, late member of the Jury of Awards on Wood-Working Machinery, Paris Exposition of 1878. The book is well illustrated, and is designed as a practical aid to those who use saws for any purpose. The price is one dollar.

ANNUAL MEETINGS OF SOCIETIES.—During the past and present week the annual meetings of numerous engineering and collateral societies have been held throughout the country. Very many valuable papers have been read, and the aggregate value of these meetings of earnest and intelligent men cannot be estimated. We note this week reports of such meetings as have come to hand. During the year ENGINEERING NEWS will publish in full the most valuable papers that have been read.

MEETING OF THE AMERICAN SOCIETY.—The event of the week in engineering circles has been the annual meeting of the American Society of Civil Engineers, which, each succeeding year is bringing together a larger number of representative engineers, to form mutual acquaintances, exchange professional opinions, become more intimate with the practical working of the society, and to secure the benefits of the reading and discussion of papers, and the excursions to important engineering works in this city. The society is growing in importance and as the best engineering talent of the country is added to its membership, so will it become the factor in public affairs which the prominent and responsible positions filled by its members entitles it to. It is now located in its own house; its library is overflowing with the best of engineering literature, its papers are valuable, and its advantages to the profession are many and great.

PANAMA CANAL CONTRACTS.—The Franco-American Trading Co. lately procured a contract for cutting some sixteen kilometers of the Panama Canal. M. Sereuilh, who is the representative of the company, and who is now in New York, said to a reporter of ENGINEERING NEWS: "Our company was formed for the purpose of doing contract work on the canal, and we have already done considerable, especially at Panama, where we have opened streets, erected a hospital, &c. Our present contract is, however, larger than we expected, and we shall not be able to begin work before five or six months. I have almost concluded arrangements with the Pound Manufacturing Co., of Lockport, for the delivery of several dredges, and I shall probably obtain excavators from the same house, as I do not wish to have to do with a number of firms, unless there are decided advantages. The portion of the canal which we have is near Panama, and the excavation will be easy, as the soil is mud, sand and argillaceous matter. We have our drawings of the machinery we require. We have also formed a company for supplying Panama with water-works. The capital is fully subscribed, and we have had several propositions from engineers and contractors, but have made no arrangement as yet." In further conversation M. de Sereuilh stated that the company had also done some work on the Colon side, but that Mr. Slevin, of San Francisco, had a large contract there, and would be ready to commence operations in a few months. Speaking of the general state of the canal enterprise, M. Sereuilh stated that very little real advancement had yet been made in cutting, but that some 50 kilometers in length and from one to one and a half kilometers in width of the line had been freed from timber. Most of the wood had been burned, but a large portion had been kept for engineering purposes, preventing land slips, etc.

MATERIALS OF ENGINEERING.—This is the title of the latest addition to the literature of the profession. The author is Prof. Robert H. Thurston, of the Stevens Institute, well known by his many previous contributions to our knowledge of the exact sciences. The volume before us is Part I., (Parts II. and III. to be published hereafter), and treats of the non-metallic materials. The opening chapter is devoted to stones and cements, classifying and describing them, entering into their many uses, giving the nomenclature of "masonry," and from the latest sources, in tabulated form, the hardness, transverse strength, durability, etc., of the stone in most common use. Then follows a practical and most valuable treatise on Timber, describing and illustrating all the varieties used in constructive engineering, setting forth the location of growth and average general dimensions, the felling of timber, seasoning, shrinkage, inspection, effects of climate and soil, etc. The succeeding chapter on the "Strength of timber, its adaptation and preservation," embracing as it does the result of the investigation of so eminent an authority as Prof. Thurston, needs little comment here, we might only add that it is thoroughly practical in its method of treatment, and the carpenter and builder will find it just as valuable as will the engineer. Chapter IV, is given to the "Fuels" used in engineering and metallurgy, and treats most fully on the composition, efficiency, temperature, evaporation, power, and commercial value of the fuels of all countries, artificial as well as natural. The next chapter is devoted to lubricants," and bears evidence, as does, indeed, the entire work, of much careful and patient personal investigation; the results of these experiments are presented in the form of comprehensive tables, which, with the accompanying text, reach almost every point of interest relating to the subject. The final chapter treats of leather, belting, paper, rubber, and cordage; their appearance, qualities and application.

The book itself is from the press of John Wiley & Sons, handsome in appearance, agreeable to read, and profusely illustrated by well executed plates. All quantities throughout the text are expressed in British measure, but are accompanied, within brackets, by the metric equivalent. And in the form of an Appendix, this volume contains the Conversion Tables of Lieut. Rogers Birnie, U. S. A., published previously, only for the use of the U. S. Army, and those of Capt. W. H. Noble, for the use of the British Army. Both of these tables will prove of great value to any one who has occasion or desire to study engineering progress in foreign lands. The price is three dollars.

ASHBEL WELCH.

PAST PRESIDENT AM. SOC. C. E.
(With Portrait.)

ASHBEL WELSH, President Am. Soc. C. E., died at his residence at Lambertville, New Jersey, September 25th, 1882. He was born at Nelson, Madison County, New York, December 4th, 1809. His early education was obtained in Utica until the winter of 1827, when he attended the Albany Academy and was under the immediate instruction of Prof. Henry. In August, 1827, he began his engineering life, upon the Lehigh canal. His brother, Sylvester Welch, was at that time resident engineer of that work, and there were also engaged upon it, among others, Colonel W. Milnor Roberts, Solomon W. Roberts and Edward Miller. Towards the close of 1829, Mr. Welch went with his brother to the Western Division of the Pennsylvania Canal. In September, 1830, he was engaged upon the Delaware & Raritan Canal at Trenton. In 1832 Mr. Welch was placed in charge of the feeder of the canal, and was located at Lambertville, which continued to be his residence since that time. In the spring of 1836 he made surveys and estimates for construction of the Belvidere & Delaware Railroad, and in the summer of the same year he became Engineer of the Philadelphia & Trenton Railroad.

In 1839, 1840, and subsequent years, while still connected with the railroad, he was also engaged with Captain Stockton, Captain Ericsson, Horatio Allen, and others, upon other engineering work. In 1844 Mr. Welch visited Europe, being absent six months. In 1847 he constructed a wooden canal lock at Bordentown, which was built on shore, launched and sunk to position. This was at that time considered a very successful engineering work. In 1848 and 1849 Mr. Welch made the final location of the Belvidere & Delaware Railroad, which was opened from Trenton to Lambertville in 1851. In December, 1852, the stockholders of the Delaware & Raritan Canal suddenly determined to enlarge the capacity of that canal and its locks, which was successfully accomplished within the estimates made by Mr. Welch, by April 1st, 1853. This was a work of great magnitude, and the result of the labor given to it by Mr. Welch, was a serious illness, from which he did not recover for some time.

In May, 1854, he again visited Europe, returning in September of the same year. At this time Mr. Welch was also the Engineer of the Chesapeake & Delaware Canal, which was opened in 1855. In 1859, in concert with Mr. E. A. Stevens, Mr. Welch planned and built the wharves at Amboy. During 1861 and 1862 Mr. Welch was actively engaged, in addition to his railroad and canal duties, in the experiments made in concert with Mr. Stevens for the well-known floating battery. In October, 1862, he was appointed Vice-President of the Camden & Amboy Railroad, and acted thenceforward as the executive officer of the joint railroad companies of New Jersey. In 1867 he was active in securing the consolidation of the New Jersey railroad companies, which was accomplished in the spring of that year, when he was appointed the General President of the Associated Companies, in which position he continued until December, 1871, when the roads were leased by the Pennsylvania Company. As General President of these companies he had active and constant charge of very large interests, and in particular devoted himself to the provision of good terminal arrangements in New York harbor. This was accomplished by the purchase of the Harsi-

mus Cove property, on the Hudson River, directly opposite New York, which was developed under his management, and the terminal arrangements at which point are still being enlarged by the Pennsylvania road. In 1869 Mr. Welch spent six months in Europe. Since 1871 Mr. Welch was engaged principally as consulting engineer upon various works, and during the past two years has acted in that capacity for the New York, West Shore & Buffalo Railroad, during the construction of which his advice was taken constantly by the officers of that road.

Actively connected as Mr. Welch was with the construction and operation of both canals and railways, it became necessary for him to consider very many interesting and important engineering questions. The construction and operation of canal locks particularly occupied his attention, and in 1868 he applied steam power to the locks of the Delaware and Raritan Canal, increasing thereby at once their capacity, and that of the canal 50 per cent. His method of operating these locks is still in use and entirely successful. The subject of railway signals was very thoroughly studied by Mr. Welch, and in 1865 he introduced the system of safety signals, which continued in successful operation for many years upon the New Jersey railroads.

Mr. Welch for many years gave the subject of the proportion, weight, and pattern of rails earnest attention, and in 1865 he devised rail patterns which are substantially those in use up to the present time. The steel rails of the pattern referred to were ordered from England in 1866 and laid down at a number of places between New York and Philadelphia in 1867.

The principles of the patterns adopted by Mr. Welch, with the proportion slightly modified, were gradually accepted, and are now generally adopted for all rails. The papers by Mr. Welch in the Transactions of the American Society of Civil Engineers and of the American Institute of Mining Engineers on this subject are of very great interest. Mr. Welch was chairman of the Committee of the American Society of Civil Engineers upon the form, weight, manufacture and life of rails. Mr. Welch also wrote valuable papers upon the comparative economy of iron and steel rails, and upon the relative advantages of rails with light and heavy heads.

The information of Mr. Welch upon general subjects of engineering, theory and practice was remarkably large. This was often exhibited at the meetings of the American Society of Civil Engineers at which he presided.

He generally closed the discussion of technical papers with remarks which were always pertinent, and full of valuable and thoughtful information. He was a man of very close reasoning powers, very conscientious, and in the positions which he held for many years secured the extreme confidence of those who had intrusted large responsibilities to him.

As President of the American Society of Civil Engineers he took great interest in its welfare and progress. He was chairman of the Committee of the Society on Tests of Structural Materials, and his active exertions largely aided in securing the recent favorable legislation on this subject. His address at the Convention of the Society at Washington in June last was very interesting, and abounded in instructive incidents of his busy professional life, His death has been deeply felt in many circles, religious, social and professional, and the influence of the work he has done will be felt and appreciated thoroughly as years pass by.

ANNUAL MEETING OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

In spite of the snow, ice, slush, mud, and final steady downpour of rain, that furnished the most plausible of excuses for remaining indoors, the rooms of the American Society of Civil Engineers were well filled at the opening of the annual meeting at 10 A. M. on the 17th. Many of the most prominent engineers of the country were present and the number was constantly augmented during the two days of the meeting. Elsewhere we give a complete list of members and visitors present during the whole or portions of the term. Vice-President Wm. H. Paine occupied the chair, and Secretary Bogart was in close attendance. The following ticket for officers for 1883 was unanimously elected: For President, Charles Paine; for Vice-Presidents, William H. Paine, Henry Flad; for Secretary and Librarian, John Bogart; for Treasurer, J. James R. Croes; for Directors, George S. Greene, Jr., Joseph P. Davis, William Metcalf, William E. Merrill, William G. Hamilton. The annual reports of the Board of Directors, and of the Treasurer and Finance Committee were read and accepted. The Special Committee on uniform standard of time made a report approving the action of Congress in authorizing the President to call an international congress to consider the subject, and recommended the calling of a convention as soon as possible to determine upon a standard of time that would be the best for the interests of North America. The Norman medal for the last year was awarded to A. Fteley and F. P. Stearns, of Boston, for a joint paper upon "The Flow of the Water of Sudbury River."

After a very excellent lunch, served in the Society's rooms, the convention went into afternoon session. The Committees on Preservation of Timber and Uniform System for Tests of Cements, reported progress. Capt. Michaelis, U. S. A., urged upon the convention the necessity of immediate action in an attempt to obtain from the present Congress an appropriation, to be expended in making such tests of structural material as the Society might desire, upon the testing machine at Watertown. Capt. Michaelis explained that the amount of $10,000, already appropriated by the House, was intended to meet the general expenses of caring for the machine, and making such tests as the Government might require, that tests under the direction of the American Society Civil Engineers were authorized by law, but a special appropriation would have to be made to cover such outlay. The Board of Direction was directed to appoint a committee of seven members to at once attend to this matter. Robert E. McMath, of St. Louis, proposed by letter, an amendment to the constitution, authorizing the meeting of a certain number of members of the Society at other places than New York, where papers upon special subjects could be read and discussed by members most directly interested in such subjects, such papers to be then forwarded, with the discussions, to the Society, and published in the proceedings. After some animated discussion upon the advisability of such a course, and its general effect upon the parent society, a committee was appointed to draft an amendment to this proposed amendment, that would meet the objections raised, and retain the spirit of the original amendment. This Committee reported to the convention an amendment authorizing any ten or more members of the Society to meet and read and discuss papers upon engineering subjects, whenever the establishment of such branch was approved by a two-third vote of the members of the Society; such branch organization to have no authority to transact business in the name of the parent society, and to be of no expense to the latter. Both amendments were ordered to be submitted to letter ballot.

The further discussions of Mr. Shinn's paper on the Increased Efficiency of Railways for the Transportation of Freight was next in order; letters upon this subject were read from John B. Jervis, Honorary Member of the Society; Chas. Paine, General Manager New York, West Shore & Buffalo Railroad; E. B. Vining, of the North Pacific Railroad, and from Jos. S. Paxton, of Philadelphia. The paper was afterwards generally discussed by members present.

At the evening session, Mr. Shinn's paper was again made the order of business, and so continued until adjournment.

On Thursday, the weather being very favorable, the members and visitors were taken to the Erie Basin in the Government tug, the use of which was kindly granted by Commodore J. H. Upshur, commanding the Navy Yard. At the Erie Basin the immense dry docks, recently built by Messrs. J. E. Simpson & Co., were inspected, after which the party walked over the Brooklyn bridge, and thence journeyed to Delmonico's, where they were the recipients of the courtesy of Mr. Wm. J. Hamilton, President of the Ramapo Wheel Works, in the shape of a bountiful lunch served in best Delmonico style. The magnificent office building of Mr. D. O. Mills was then visited, after which the works of the New York Steam Heating Company were inspected under the guidance of Messrs. Shinn and Emery.

The reception at the house of the Society was a most enjoyable affair. The rooms were comfortably thronged; there were many new faces, but as far as it could be accomplished, members and visitors were made acquainted with each other. Refreshments, after the usual excellent and bountiful style of New York catering, were served at 10 o'clock, after which the company were entertained with some very wonderful solos by Messrs. Worthen, Haswell and Emery, and by sundry rare selections in which "all hands round" joined with an enthusiasm that no doubt was quite startling to the neighborhood. The musical talent that exists in the American Society of Civil Engineers is as yet comparatively undiscovered, and the outbreak on Thursday evening should not be allowed to pass into oblivion.

The question of location for next convention is left to a committee with power to act. It is quite well understood, however, that the convention will be held in St. Paul or Minneapolis.

MEMBERS AND VISITORS PRESENT.

Benj. Rhodes, C. E., Niagara Falls, N. Y.; Rudolph Hering, C. E., 18 Tribune Building, N. Y. City; Edgar B. Van Winkle, Topographical Eng. Dept. Public Parks, 117 E. 70th St., N. Y. City; Casimir Constable, C. E., Constableville, N. Y.; Alfred P. Boller, C. E., Prospect St., E. Orange, N. J.; Lieut. Wm. H. Bixby, U. S. Engineer, Willets Pt., New York Harbor; Theodore Cooper, C. E., 35 Broadway, N. Y. City; Thos. J. Whitman, Water Commissioner, City Hall, St. Louis, Mo.; F. Collingwood, Ass't Eng. East River Bridge, 279 Front St., N. Y. City; G. Leverich, C. E., South Orange, N. J.; Frank W. Whitlock, C. E., Waterbury, Conn.; J. M. Knap, C. E., 365 West St., N. Y. City; W. W. Maclay, 132 E. 65th St., N. Y. City; Robt. L. Harris, 80 Columbia Heights, Brooklyn, N. Y.; C. H. Fisher, Chief Eng. N. Y. C. & H. R. R. R., Albany, N. Y.; John W. Bacon, R. R. Commissioner of Conn., Hartford, Conn.; J. W. Ferguson, Ass't Eng. N. Y. L. E. & W. R. R., 187 West St., N. Y. City; H. D. Blunden, Roadmaster, E. D., N. Y. L. E. & W. R. R., Cosmopolitan Hotel, N. Y. City; Jos. P. Davis, Eng. Am. Bell Tel. Co., 144 Greenwich St. N. Y. City; Jas. C. Post, Capt. of Eng., U. S. A Charleston, S. C.; H. Bissell, Master of Maintenance of Way, Eastern R. R., Salem, Mass.; Thos. M. Cleemann, 340 S. 21st, St., Philadelphia. Penn.; M. M. Tidd, care J. E. Simpson & Co., 35 Broadway, N. Y. City; D. Mc. N. Stauffer, C. E., ENG. NEWS, Tribune Building, N. Y. City; W. E. Worthen, Consulting Eng., 63 Bleeker St., N. Y. City; F. W. Gilbert, Ass't Eng. N. P. R. R., Brainard, Minn.; Jno. A. Partridge, Des'n Eng. N. Y., W. S. & B. R. R., Syracuse, N. Y.; T. H. McKenzie, Sec. Peck, Stone & Wilcox, Southington, Conn.; S. H. Shreve, Consult. Eng., 31 E. 31st st., N. Y. City; Geo. H. Bishop, Eng. Water-Works, Middletown, Conn.; E. R. Andrews, Old Dominion Creosoting Works, Norfolk, Va.; Geo. W. McNulty, Ass't Eng. East River Bridge, 21 Water st., Brooklyn, N. Y.; J. Avery, Bureau of Surveys, N. Y. City; Chas. Macdonald, Pres. Del. Bridge Co., 52 Wall st., N. Y. City; Wm. H. Weightman, C. E., 85 Astor House, N. Y. City; Ellis B. Noyes, 146 Jefferson st., Brooklyn, N. Y.; Dana C. Barber, 14 William st., N. Y. City; Wm. H. Atwood, Eng., N. Y., O. & W. R.R., 97 Linden ave., Jersey City, N. J.; Jos. T. Townsend, Manuf. Chemist, Glasgow, Scotland; C. C. Martin, 1st. Ass't Eng. Eaft River Bridge, 21 Water st., Brooklyn, N. Y.; Stephen S. Haight, Ass't Eng. Dep't Pub. Parks, West Farms, N. Y.; Wm. P. Judson,

U. S. Ass't Eng., Oswego, N. Y.; C. D. Ward, 314 York st., Jersey City, N. J.; R. P. Staats, Ass't Eng. N. Y., L. E. & W. R.R., 187 West st., N. Y. City; John Lockwood, 52 Broadway, N. Y. City; W. W. Wilson, Eng. Water-Works, Yonkers, N. Y.; A. B. Paine, Chief Eng. P. S. & N. E. R.R., Westminster Hotel, N. Y. City; J. J. R. Croes, Treas. Am. Soc. C. E., 63 Bleecker st., N. Y. City; Wm. B. Swan, C. E., 164 E. 116th st., N. Y. City; J. M. Goodwin, Eng. Sharpsville R.R., Sharpsville, Pa.; O. E. Michaelis, Capt. Ordnance Corps, U.S.A., Frankford Arsenal, Philadelphia, Pa.; T. N. Ely, Gen. Supt. Motive Power, Penn. R.R., Altoona, Pa.; Thos. J. Long, Asst. Eng. Dept. Docks, U. S., 117 Duane st., N. Y. City; Edward P. North, C. E., 127 E. 23d st., N. Y. City; C. A. Goodnow, Gen. Supt. N. H. & N. R.R., New Haven, Conn; S. B. Opdyke, Jr., N. H. & N. Co., New Haven, Conn.; Nelson J. Welton, Waterbury, Conn.; Wm. P. Shinn, Vice Pres. N. Y. Steam Heating Co., 22 Cortlandt st., N. Y. City; Jas. O. Osgood, Milton, Mass.; Charles L. Goad, Montreal, Can., and 344 W. 48th st., N. Y. City; John G. Vanhorne, 15 Cortlandt st., N. Y. City; W. R. Curtis, Rockland, Mass.; Samuel M. Gray. City Eng., Providence, R. I.; D. E. McComb, Ass't. Eng. D. C., Metropolitan Hotel, N. Y. City; T. E. Sickles, Consult. Eng. U. P. R.R., Union Pacific Office, 195 B'way, N. Y. City; W. H. Paine. Vice Pres. Am. Soc. C. E., 21 Water st., Brooklyn, N. Y.; Alfred R. Wolff, 85 Astor House, N. Y. City; W. H. Wiley, 15 Astor pl., N. Y. City; Geo. S. Greene, 127 E. 23d st., N. Y. City; Chas. E. Emery, Eng. N. Y. Steam Co., 22 Cortlandt st., N. Y. City; Cook Talcott, 88 Cortlandt st., N. Y. City; De Volson Wood, Prof. Math. and Mech. S. Inst., Hoboken. N. J.; Lebbeus B. Ward, 63 Bleecker st., N. Y. City; Chas. J. Everson, C. E., Middletown, N. Y.; G. S. Greene, Jr., Chief Eng. Dept. of Docks, N. Y. City; Willard A. Nichols, First Asst. Eng. Dept. Docks, 117 Duane st., N. Y. City; John B. McDonald, contractor, N. Y., W. S. & B. R.R., Syracuse, N. Y.; Edw. S. Safford, Div. Eng, N. Y., W. S. & B. R.R., Newburgh, N. Y.; W. W. Walker, Pres. and Gen. Supt. St. L., H. & K. R.R., Hannibal, Mo., 109 S. Oxford st., Brooklyn, N. Y.; J. Gardner Sanderson, Vice-Pres. Wallkill Portland Cem. Co., Tribune Building, N. Y. City; D. M. Greene, Director Rens. Pol. Inst., Troy, N. Y.; Prof. T. Egleston, School of Mines, Columbia College, N. Y.; G. H. Frost, ENG. NEWS, N. Y. City; Edw. S. Philbrick, 12 West street, Boston, Mass.; Geo. L. Vose, Prof. Civil Engineering, Inst. of Tech., Boston, Mass.; P. H. Dudley, C. E., 66½ Pine st., N. Y. City; O. Chanute, Chief Eng. N. Y., L. E. & W. R. R.; Wilson Crosley, C. E., 115 B'way, N. Y. City; F. A. Calkins, Eng. Cer. Park, 75 W. 127th St., N. Y. City; C. H. Fisher, Chief Eng. N. Y. C. & H. R. R., Albany, N. Y.; Arthur Macy, Civil and Min. Eng., 609 Lexington avenue, N. Y. City; Stevenson Towle, Eng. in charge of Sewers Dep't. Pub. Works, 31 Chambers st., N. Y. City; M. N. Forney, Ed. *Railroad Gazette*, 71 B'way, N. Y. City; Martin Coryell, Civ. and Min. Eng., Lambertville, N. J.

ANNUAL MEETING OF THE MICHIGAN ASSOCIATION OF SURVEYORS AND CIVIL ENGINEERS.

The fourth annual meeting of the above energetic and useful association was held in Lansing, Mich., on the 9th, 10th and 11th inst., and resulted in a very large attendance from among the best representatives of the professions interested in that State, and in the communication of much valuable information through the reading and discussion of papers presented. The following were elected members: C. H. Cavis, Marquette; Geo. H. Carleton, Sault Ste. Mary; Geo. H. Pierson, Kalamazoo; J. Ludington, Verona Mills: J. C. Leonard, Union City; T. W. Petty, Montrose, Genesee County; Joseph A. Graham, Isabella County; William P. Innis, Grand Rapids; Karson Freeman, Grand Rapids; S. Hemingway, Berrien County; H. J. Orwig, Big Rapids; A. G. Fuller, Kalamazoo; J. J. McVean, Ionia; Prof. C. F. R. Fellows, Ypsilanti; P. H. Dowling, Rome; Q. A. Thomas, Oxford; Jos. S. Greene, Oxford; Wm. Appleton, Lansing; Sherman Olmstead, Midland; Horace Jerome, Cars Bridge; Walter Russell, Detroit; A. R. Stowell, St. Clair; Francis M. Priest, Bryan, Ohio; R. Shoedde, Manistee; F. P. Mills, Crystal Falls.

The following were elected officers for the ensuing year: President, Prof. J. B. Davis of Ann Harbor. Vice-Presidents, James Sanderson, Detroit; Burton Kent, Adrian; C. M. C. Snover, Jackson; Amos Smith, Vandalia; D. Skeels, Grand Rapids; E. C. Smith, Pontiac; John J. Watkins, Lapeer; P. C. Heald, Midland; John A. Mitchell, Ludington; John M. Johnson, Bay City; Geo. P. Cummings, Marquette. Secretary and Treasurer, Prof. R. C. Carpenter, Agricultural College. Executive Committee, E. F. Guild, East Saginaw; H. C. Pearsons, Ferrysburg; J. J. Watkins, Lapeer; and the President and Secretary.

Geo. E. Steele of Grand Traverse, read a paper on the "Legislative Needs of the Profession;" H. D. Bartholomew, of Lansing, read a paper on "Dams;" H. G. Rothwell, of East Saginaw, one on "Cedar Block Pavements;" Prof. C. E. Greene, of Michigan University, read a paper on "Difficulties in Practical Engineering Caused by Water;" Burton Kent, of Adrian, read a paper on "Construction of Common Roads;" A. J. Teed, City Engineer of Cadillac, read a paper on the "Difficulties in City Surveying;" Chas. B. Hyde, City Engineer of Jackson, read a paper on the "Construction and Care of Water Works Suitable for Small Cities in Michigan." This paper gave the history, the failures and successes of the waterwork system at the city of Jackson, and is of much value to engineers of small cities.

E. F. Guild, of East Saginaw, read a paper on the "Construction of Logging Railroads." Mr. Guild has had charge of the construction of many logging railroads, and the paper was the actual result of his experience. It brought out a good deal of discussion.

Kassom Fuller, of Grand Rapids, explained the merits of a new surveying instrument for superseding the chain and chainmen, and L. E. Gurley, of Troy, N. Y., gave the society an address on surveyors' instruments. He was prepared to illustrate many of his remarks by examples of his own make. Frank Hodgman, of Climax, read a paper on "Mountain Railroads." A. L. Reed, chief engineer of the Port Huron & Northwestern Railroad, briefly addressed the association on "Construction and Operation of Narrow Gauge Railroads."

The annual meeting of the association closed on Thursday evening, with papers by President Davis on "Traverse Surveying," and by S. N. Beden on "Engineering of Town and County Drains." It was generally conceded that this was the largest and most interesting meeting that the society has ever held.

The display of instruments was particularly large and fine, and several representatives of noted manufacturing firms were present.

THE WESTERN SOCIETY OF ENGINEERS.

Mr. D. C. Cregier, Commissioner of Public Works, Chicago, has been elected President of the above society, and Mr. G. A. M. Liljencrantz, Librarian. Mr. L. P. Morehouse, who has been the very efficient Secretary from the first meeting, is re-elected.

ENGINEERS' CLUB OF PHILADELPHIA.

At the 5th annual meeting, held Saturday evening,, the 13th, the retiring President, Rudolph Hering, delivered the annual address, after which the following officers for 1883 were elected: *President*, Henry G. Morris; *Vice-President*, William A. Ingham; *Secretary and Treasurer*, Howard Murphy; *Directors*, T. M. Cleemann, Frederic Graff, Rudolph Hering, Strickland Kneass and Percival Roberts, Jr. The following were elected active members of the Club: A. R. Cruse, R. H. Bartleman, Arthur Winslow, R. Seymour, M. W. Rudderow, H. T. Townsend, Wm. McIlvaine and W. J. Root.

The membership of the Club increased 20 per cent. last year; the general status and future of the Club are most gratifying and promising.

ELECTIONS AND APPOINTMENTS.

CHICAGO & GREAT SOUTHERN.—The officers of this road are: Contractor and Manager, Henry Crawford; Chief Engineer, J. O. Baird; Superintendent, Henry Crawford, Jr. Office in Chicago.

LAKE ERIE, WOOSTER & MUSKINGUM VALLEY.—Chief Engineer, J. F. Wallace; Assistant Engineer, John Herron. Offices in Wooster, Ohio.

MEMPHIS & LITTLE ROCK.—Mr. H. G. Fleming, Chief Engineer, is appointed Superintendent also, in place of W. E. Smith, resigned.

PORTLAND & OGDENSBURG.—John F. Anderson, Chief Engineer.

We will be pleased to have "Personal" notices sent us, also early notices of elections and appointments. There is no way so easy to inform friends and acquaintances of such news as through this column. Everybody reads it.

A MEXICAN RAILROAD CONTRACTOR.

The introduction of railroads and Yankee enterprise into Mexico is drawing the attention of the outside world to the easy-going, jog-trot sort of life that is lived there. It is a land where the sewing-machine, the telephone, and the book-agent are as yet unknown, except in rarely-favored localities. As an illustration of the quaint yet exasperating backwardness of the people, the following incident is related as having recently happened: A railroad official in the State of Chihuahua advertised for a number of railroad ties. Among those who responded to the demand was an enterprising Mexican, who expressed his ability to supply these articles. "How many can you supply?" asked the railroad magnate. "Excellenza can have as many as he will," replied the Mexican with an expressive shrug. "Well, if we should want 500 ties, what would they cost us?" After some complicated figuring and much pantomime the Mexican announced that he could supply that number at the rate of 50 cents apiece. "And suppose we should want 5,000?" inquired the official. "Holy Madonna! that is a large order," answered the native; "I must charge at least 75 cents apiece." He was then laughingly asked what price he would deliver 500,000 for. And after more pantomime calculations he solemnly announced that for such a tremendous order as that he would have to charge at least $2.50 apiece for the ties. The railway official has concluded that, notwithstanding all his limitations, he would rather deal with a Connecticut Yankee.

THE MAN WHO NEVER ADVERTISES.

Sing, business muse, the dark and doleful fate
Of him who labors but that he may wait:
The piles of goods heaped up within his store,
Which can't be less, and never may be more:
The man whose life has lost all fortune's prizes;
In fact, the man who never advertises.

Sing of his start, his great ambition's scope,
The capital that gave him cause to hope,
His credit large, his full and ample stock,
His bank account as solid as a rock;
Then tell the doom to which the man was fated
Who never advertised, but simply waited,

So simply, and so vainly! Splendid signs,
Which basement art irradiates and refines,
Plate glass show windows elegantly dressed,
Such lovely clerks, cashiers, and all the rest,
Served but to show him how the public sizes
The style of him who never advertises.

He waited, and all waited; clerks, cashiers,
Salesmen, saleswomen, such delightful dears,
Impatient waited all the season through,
With precious little for the crowd to do.
The public saw—that fact there's no denying—
But passed the store without a thought of buying.

Business was dull, but salaries and rent
Went on till cash and credit both were spent;
The silly merchant hoped his luck would turn,
Until the Sheriff closed the whole concern.
Now, at a pittance which his soul despises,
He works for one who always advertises.

—*N. Y. Sun.*

BRIDGING THE INDUS.

THE PROGRESS OF THE CIVILIZING RAILWAY IN THE EAST.

It has been announced that the bridge across the Indus at Attock is all but completed, and that Lord Ripon, the Viceroy of India, will pay a visit to the spot when the opening ceremony is to be gone through. This event is of some historical importance, as it is the first unbroken extension of the railway system of India beyond one of the usually accepted boundaries of that extensive country. Attock is generally rendered as meaning "obstacle," the doubtful explanation being that

it presented an obstacle, or difficulty, to the Hindu, who, if he crossed, and left the sacred land of Bharata-Varsha, would lose caste. This difficulty, like that of venturing on the kafirpani, or the ocean, which was also supposed to be an infringement of caste routes, has long been overcome, and Brahmins now cross the Indus without any fear of contamination. It is generally supposed that Alexander crossed this river some distance above Attock, but some critics place the event at the latter place. According to Arrain, the great Macedonian crossed the river with his army on a bridge of boats, and from that date to the present day a similar bridge has existed. Judging from Arrian's description of the manner in which the boats were moored with ropes, and the roadway formed of planks from boat to boat, there seems to have been almost no difference between Alexander's bridge and the one which has continued to our own times. The boats on the Punjab rivers have a peculiar high prow, suggesting an antique type, and may possibly be but little changed in their form since the period of the Greek invasion. The bridge was kept up all the year with the exception of a short period, beginning about June, when the water rises, owing to the melting of the snow in the Himalayas and the Hindoo Kush, when the rush of the flood would be too great and the boats could not stand the strain. As this break in the line of communications continues for a month or two, rendering it a difficult task to send reinforcements and supplies to Peshawur and the frontier stations, larger garrisons had to be kept up in these places, in case of any sudden outbreak, than would have been otherwise necessary. These military considerations led the government of India many years ago to think of plans for establishing a permanent way at Attock, and one of the proposals was to form a tunnel beneath the river. Lord Canning and Lord Clyde visited Peshawur early in 1860, and on their way the first blast was fired which began a preliminary boring. This tunnel was continued for some distance but the percolation of the water became too great, and this scheme was ultimately abandoned.

By the time this failure took place the railway system of India had so far advanced, and its extension to the Indus being in contemplation, which would necessitate the bridging of that river, no other attempt was made. When the great main lines of railway were made connecting Calcutta, Madras, Bombay, Delhi, and Lahore, the necessity for numerous branches as feeders was strongly felt by the government, and the size of India and the sums of money required for such plans led to the adoption of a system of narrow guage lines for the branches. It was at this time the line from Lahore to Peshawur was laid out, and the narrower guage was, of course, chosen for it. The works were begun and the bridges on the first section were being made when Lord Napier, of Magdala, who was commander-in-chief at the time, took the matter up on military grounds. He justly considered that in the event of an important war on the frontier, or, perhaps, looking further into the future, when our boundary might be extended toward Central Asia, and serious work had to be done, a break of gauge at Lahore would become a heavy obstacle to our movements. Lord Napier's influence caused the government to interfere, and the Punjab Northern State railway had to change their plans; the first portion of the line had almost all to be made over again. This led to great delay. The large rivers which give the Punjab its name had to be bridged, and as all the iron material had to come from England the progress of the work was slow. The great bridge across the Chenab was finished in 1876, and the Prince of Wales, on his visit to India, performed the ceremony of hammering in the last rivet. When the Afghan war began, in 1878, the Jhelum bridge was fortunately completed and the railway was in working order as far as the north bank of that river, a distance of 102 miles from Lahore. This left 169 miles from the Jhelum to Peshawur without railway. Along this distance troops had to march at the slow rate of about 12 miles a day, which is the average distance in India, and military stores had to come over the same ground in bullock carts at the usual slow speed of two miles an hour. In the new state of things even this break in the railway was severely felt. At the porte of Gundumuck, when the troops were all ordered back to their cantonments in India, the military value of a permanent bridge over the Indus received a good illustration. The march back took place in the early part of June, when the Indus was rising, and the question as to whether the bridge of boats would hold out till the regiments reached the other side became serious. If the bridge should break, the tedious process would have to be gone through of ferrying men and stores, with a strong flood sweeping the boats a long distance down stream at every crossing; in the case of cavalry and artillery the difficulties of the operation would be still greater, and accidents would be all but certain. Luckily the bridge held on till everything was got over, and that was, in all probability the last occasion when the crossing of the Indus at Attock will be a cause of anxiety. It is forty miles from Attock to Peshawur, but there is level ground the whole way and no rivers to cross, so that the line will be easily made; when this is done there will be direct communication, and witout break of gauge, from Calcutta and Bombay to within a few miles of the Khyber pass.

Travelers who make a hurried run through India will soon be able to get as far as Peshawur, and see the mountains of Afghanistan. A morning's ride will take them to Jamrud, where they will get a peep into the commencement of the Khyber pass. A stoppage at Attock will repay the time; the fort is a large one, on rocky heights overhanging the Indus; there are high walls with loopholed battlements in the style peculiar to India; the towers and gateways are of the most picturesque character, the whole forming a grand mass, beside which the Rhine castles would become the merest toys. Attock is the beginning of a rocky gorge where the waters of the river are confined for some distance below. Looking up the river, the country opens out into the Peshawur valley on the left, with the Yuzufual district in the distance, while on the right is the hill country leading up to Cashmere, the whole presenting a landscape of the most varied character. It was the Mohammedan emperors who enlarged this fortress, as a protection from attacks; Runjit Singh could not conquer it, but managed to bribe the officer who commanded. It belonged at the time to the Afghans, who ruled about that period as far as Cashmere.—*London Daily News.*

OLD ENGLISH TURNPIKES.

How many members of our coaching clubs who now "tool" their drags with such ease and pleasure along our roads have any idea of their condition seventy years ago? Turnpike-roads were then in a hopeless state. There were nearly 25,000 miles of them, and their tolls were pledged for 7,000,000 sterling—a debt which was increasing every year, although the annual income of the turnpike trusts were one million and a quarter. Miss Edgeworth's father, in his "Essay on the Construction of Roads and Carriages," said that in a journey of several hundred miles he found scarcely twenty miles of well made road, and that in many parts, especially round London, they were in a shameful condition and much inferior even to the roads then to be seen in Ireland. In January, 1820, when there was a sudden thaw after a hard frost and heavy snowfall, "the roads of the kingdom broke up in a very alarming manner; many, especially the chalky roads and those near London, broke up to the bottom and became impassable." Communication was interrupted, the mails were delayed, and very heavy expenses were entailed on the Postmaster-General.

The Scotch roads were much worse than the English, although road materials were superior and more abundant in Scotland. In a debate in 1811 it was admitted that they were in a deplorable state, and in their circumstances bankrupt. The mail from Glasgow to Ayr had to be discontinued about this time, owing to the utter badness of the road and the amount of the tolls. There were as many as ten toll-gates in a distance of thirty-four miles.

Coaching men have met with plenty of less entertaining reading than the evidence given before the Committees of the House of Commons in 181I, 1819 and 1823 on this subject, when many of the great coach-masters of the day gave the results of their experience. They take us back to olden times when such places as the Swan with Two Necks in Lad lane, the White Horse in Fetter lane, the Angel Inn, St. Clement's and the Golden Cross were familiar as household words all over England. Turnpike roads were then about twelve feet wide, with a broad hedge on each side, cut flat—as may still be seen in the Isle of Wight—to let the "outsides" fall soft, as used to be jocosely said, when the coach tipped. The common mode of making a road in England, and the universal mode in Scotland, was to dig a trench three feet deep, half fill it with very large stones and follow with smaller ones of about eight pounds weight. This was called the "bottoming;" and on this the road was built with a foot and a half of broken stone, flints, large pebbles or gravel, mixed, according to the locality, with clay or chalk for "binding." The immediate consequence was that the trench drew water from the adjacent fields; there was no possibility of getting rid of it; and the road was thus in rainy weather generally "standing in wet," as was technically said. This rotted the structure, which was ready to give way at once on any change of weather. To escape from the water, repairs were effected by constantly shooting large quantities of materials on to the middle, where they were left to work their own way down to the sides. The surface thus came to resemble a roof, and, as McAdam described it, "unless kept in the very centre, a carriage goes upon a dangerous slope." This slope naturally interfered also with the draft of the coach by flinging the weight too much on one side. It is interesting here to note that a coach, whether "mail," "post," or "heavy," was reckoned to weigh forty cwt.—that is to say, coach a ton, passengers half a ton and luggage half a ton. The coachmen, according to Mr. John Eames, used to say that driving on the slope tore the horses' hearts out; and, on the other hand, another coach-master alleged that he had killed some hundreds of extra horses pulling through the gravel heaped up in the middle. As it was only there that a vehicle could run upright, every one tried for it; and the consequence was that the horses and the wheels made ruts—the "gridiron," as it was graphically called—of the depth of which we, fortunately, have no idea, and which were always full of water. Then when two coaches had to pass or to get around a wagon it was a terrible moment; and "spills"—and fatal ones—were but too common. The clay and chalk, which were employed in quantities under the mistaken idea that they "bonded" the stones, only absorbed the wet; the road became loose; and carriages, instead of rolling over it, ploughed it up. When frost came it was affected to a great depth; and on a thaw the whole structure would go to pieces to its foundation. But there were ingenious variations in bad making. Telford the engineer, and the superintendent of mail-coaches both described many miles of road which were not high but hollow in the centre, the sides encumbered with great eight-foot banks of road-scrapings, which threw a deep shadow over what they left of the twelve-foot road, and prevented the water from running off into the side drains, which were always neglected.

The roads round London were the last to improve. There were several causes for this: one was the clayey nature of the unwashed "gravel" solely used for repairs; another was the great number of small trusts by which they were managed. Most of the roads were very low, and exposed to flooding; and the traffic, of course, became greater as it concentrated towards the metropolis. The Uxbridge road, for instance, was flat and lower than the fields, and had mountains of mud on each side. It was always under water. On the Dover road there was an execrable piece called "the Sun in the Sands," which was almost a quicksand. Between Staines and Bagshot, nine miles and a half, the mails in winter used to lose twenty minutes in 1818. This extra badness continued even as far as fifty, sixty and a hundred miles out of London in some directions.

It need scarcely be said that rollers were unknown. They were still quite a new invention in 1819, when, it is believed, they were first employed on the Northeast or Edinburgh road. But in the days before rollers wagons were granted considerable exemption from tolls, apparently from a mistaken impression that their weight consolidated the roads. The fact was that their gigantic barrelled wheels, five and six inches broad, with immense projecting bolts, crushed the ill-made surface into great ruts, while the heavy teams, driven in a string, made the third rut which commenced the "gridiron." The "lordly Wain" which delighted Wordsworth in 1806, and which then performed almost all inland carriage (the Regent's Canal, for instance, was not opened until 1820), was the despair of road surveyors, and was far

> That far-off tinkling's drowsy cheer,
> Mixed with a faint yet grating sound,
> In a moment lost and found.

from being all poetry.

The waste in horseflesh and the cruelty to animals caused by those bad roads was enormous. It required five and sometimes six horses to work the first fifty miles out of London, when four sufficed elsewhere, and the larger number cost £30 each, as compared with £15 farther out, so that £100 was said to go as far in horseflesh in the country as £270 near London, where these better horses lasted only three or four years, as against six to eight in the provinces. Such were the conclusions of Mr. Horne, who kept the Golden Cross Inn at Charing Cross, and was in partnership with Mr. Pickwick, of Bath. Other large coach masters corroborated him, and it was not alone the Road Trusts that were deep in debt and in distress for money. The coach masters were constantly failing from the great strain on their resources.

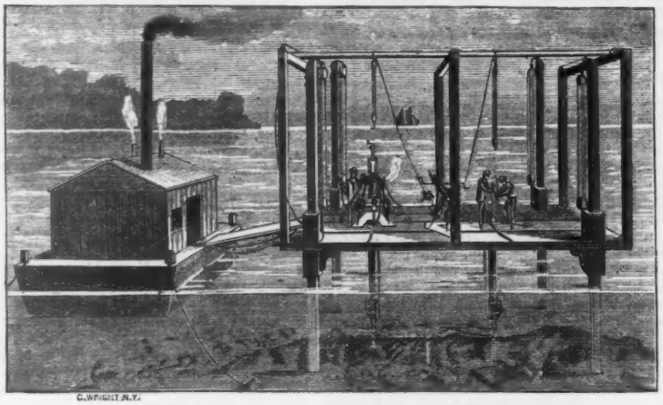
All roads were then defective in direction and inclination. They were carried right over steep hills, which might have been turned. And the explanation of this becomes apparent if we consider that in the days of pack horses and of pillions the old roads, or rather tracks, were often taken along the tops of hills in search of dry and strong ground. The first turnpike roads merely widened and made wheel roads of these rocky paths, and our ancestors, no doubt, dug the trenches that have been described, wherever the hard, stony ground failed them, in a blind endeavor to continue it artificially. It is worth noting that the first toll gate or turnpike on a road was set up under Charles II. in 1663, replacing the old turnstile (or turnpike, as it came to be indifferently called) on the riding track. These old turnstiles were formed of four horizontal arms or pikes, revolving on the top of a post, whence their second name.

The cost of repairs was enormous. For an average distance of seventeen miles on each of twelve roads out of London, there were twelve trusts, under twenty-four Acts of Parliament; and there were as many as 955 trusts throughout England, which gave only an average of twenty-six miles to each. On these twelve London roads the repairs cost in 1818 the almost fabulous sum of £471 a mile, exclusive of that oppressive and wasteful impost, forced local or "statute" labor, which was reckoned at 5 per cent. more. The tolls were £464 a mile in that year on the same roads, and they were in debt £298 a mile. The tolls were always on the increase, and had doubled between 1805 and 1819. On the Holyhead road, near Daventry, the year's tolls were worth over £100 a mile. The "gates" were let for large sums. Coaches paid on an average 3½d. a mile in tolls, which would make £3 for one trip from London to Liverpool, and the Scotch tolls were actually double that rate. We have said nothing here of the parish or cross roads, which had reached, if possible, a more dreadful pass than the turnpike roads. The acts on the subject were so defective that the parish roads were practically considered as out of the protection of the law, and the committees of 1811 and 1819 gave up the subject in despair.

Finally, it should not be forgotten that much of the success and consequent fame of "gentlemen of the pad" is to be attributed to the wretchedness of the roads, which rendered rapid travelling impossible and hindered the escape of their prey. The decay of the highwayman's calling may in great part be traced to the making of good roads, and these again to the appearance of John Loudon McAdam.—*St. James Gazette.*

IMPROVEMENT IN SUBMARINE ROCK-DRILLING.

Under prevailing methods the removals of submerged rock by drilling and blasting, is an expensive and tedious operation. Anything novel, tending to lessen the difficulties, and consequently the expense, must be of interest to both the engineering and commercial world, and it is with this thought that we illustrate in this issue an entirely new Drilling plant, patented within the month, by W. L. Saunders, C. E., now in charge of submarine work for the Ingersoll Rock Drill Co., of this city. The appliance has been thoroughly tested in New York harbor, and holes have been bored. The small pipe rests directly upon the rock surface. A smaller pipe conveys a powerful water jet to the bit of the drill, passing through the telescopic tubes to the surface, and by its action forms an ascending water current in the drill-hole which conveys the chips, etc., into the conical



IMPROVEMENT IN SUB-MARINE ROCK DRILLING.

drilled, charged, and blasted with it through six feet of gravel overlying the rock.

The purpose of the apparatus is to remove the drill chips, keep gravel, sand and mud, out of the drill hole, and to allow charging and tamping without using a diver. This is accomplished as follows: The ordinary drill is worked within a telescopic tube, considerably larger than the drill, the lower section of the tube terminates in a cone, connecting the large pipe above with a straight section of pipe a little larger than the hole to be chamber. An arm, open at the top, projects upward a short distance from one side of the conical chamber, forming with its axis, an acute angle with the line of drill; a nozzle connected with a steam or water jet, occupies a central position in the base of this branch, and thus forms an "ejector," which throws outside the detritus driven into the conical chamber by the smaller jet.

The accompanying cut illustrates the method of using it, and also some novelties in the drilling stage.

TRUSS BRIDGES.

AN ILLUSTRATED HISTORICAL DESCRIPTION OF ALL EXPIRED PATENTS ON TRUSS BRIDGES, WHICH UNDER THE LAW ARE NOW PUBLIC PROPERTY AND FREE TO BE USED BY ANY ONE.

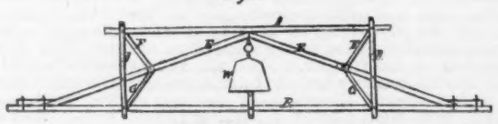
By F. B. Brock, Patent Attorney, Washington, D. C.

July 6, 1852, J. B. Gridley, of New York, patented a truss bridge.

A is the top and *B* the bottom chord; *D* are tie-timbers uniting the chords having openings for the passage of the posts and braces; *E* are diagonal main braces secured at their lower ends by stirrups to the lower chords, and meet at the centre of the top chord where they are united by a metal step; *F* are the upper and *G* the lower counter braces, which connect the main brace and upper and lower chords through metal steps *b*. The lower counter braces *G*, for either half of the span, incline upwards away from the nearest pier, while the upper ones *F* incline reversely throughout varied angles thereto.

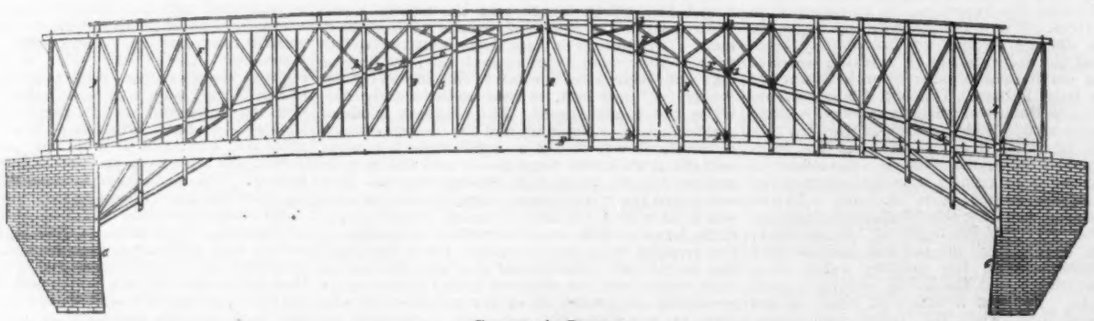
By this combination of chords, tie-timbers, main braces and counter braces, it is obvious that a weight or strain brought upon the bridge at its centre will have a tendency to depress the chords at the middle bringing the outer ends toward each other, while the outer ends of the main braces *E* will have a tendency to recede from each other, so that

Fig. 2.



the counter braces *F G*, in having the strain communicated to them, will, by their inclined positions, press so as to exert a tendency to expand the upper end lower chords, and to counteract the expansion of the main braces and upper counter braces *F*. This action serves, by the deflection of the top chord and straightening of the main braces, to press upwards against the top chord, while the lower counter braces, in pressing downwards, combine to throw a direct tension upon the tie-timbers, which results apply the sustaining weight in the direction of the fibre.

Fig. 1.



GRIDLEY'S BRIDGE.

(TO BE CONTINUED.)

SOUTHERN ENGINEERING ENTERPRISE.

The Memphis, Vicksburg and New Orleans, or what is better known as the Wilson line of railroads, is now building a very large iron bridge over the Yazoo River, some twelve miles above Vicksburg, Tenn. For some time past the construction of the piers for the bridge has been vigorously prosecuted, and the contractors are now employing about 150 experienced men. The construction of a bridge at the point selected is for several reasons unusually difficult and expensive. There is no bed rock or other material within reach for the foundations to rest upon, and the river, even at low water, is nearly forty feet deep, while at high water the depth reaches eighty or ninety feet. During the summer or early autumn the unhealthiness of the region would entirely unfit men for the trying labor required of them, so that the period during which the work has to be performed is limited to three or four months, and hedged in between fever and floods, the utmost energy must be exerted to accomplish the work.

The bridge will consist of three spans about 300 ft. long each, two of them fixed spans and the third, a draw span, located in the middle of the channel. These will be some 6 ft. above the level of extreme high water and slightly above the elevation of the banks on either side. There will be five piers, one at each end on the bank and three in the river. To obtain the requisite supporting capacity, piles—100 in the pivot and 72 in each of the other two channel piers—are driven to a depth of 40 ft. into the river bottom. The outfit to drive these piles consists of a regular pile-driver engine, with a 4,000-lb. hammer, a Skinner steam hammer weighing 7,000 lbs. and a large duplex Worthington pump to supply a water jet when this can be used in place of driving, or to assist the latter. When the jet can be used to advantage, pipes are so arranged that one or more powerful jets, such as fire engines would supply, are brought into play at the point of the pile, excavating a hole for this latter to sink into. The Skinner steam hammer is simply a steam hammer similar to those seen in large machine works, which is held over the pile in such a manner that it may pound the pile down by hitting it successive blows with great rapidity. The piles for one pier have now all been driven and have reached such a firm bearing that an excellent foundation for the piers is assured.

The left bank of the river is occupied by a number of buildings for the men engaged in constructing the bridge, while a floating saw-mill is stationed in the river and is employed in preparing timber to be used in the caissons. One of these was recently launched and a second one is now rapidly nearing completion. The one for the first pier is 50 ft. in diameter, with sides 2 ft. thick and 6 ft. high. The roof consists of solid timber and is 7 ft. thick. A pneumatic caisson, as many of our readers undoubtedly know, may be described as an immense box without any bottom, but otherwise air tight. After the piles are driven they are sawed off and the caisson is floated into a position directly over them. The construction of the pier proper, which will consist entirely of concrete, is then commenced on the roof of the caisson while this is still afloat. As it sinks it is held in proper position, and when it touches the piles air will be blown into the caisson by means of large air compressors run by steam. The men descend into the caisson through air locks. The piles are then again sawed off as low as possible—that is, even with the bottom of the caisson—and it is then sunk still lower. This sawing off and sinking is continued until the caisson is settled even with the bottom of the river. While this sinking has been going on the concrete has been built upward, and when the caisson is settled firmly on the piles for the last time the pier is built up to the proper height to receive the coping, which will be of stone 2 ft. thick. On this the iron bridge spans will rest.

It will be seen that the piers, when complete, will consist of piles sawed off level with the bottom of the river. Surmounting these is a solid platform (the roof of the caisson) of timber 7 feet thick, on which will rest the piers proper, which will be one continuous mass of concrete. Some idea of the enormous quantity of material in the piers may be formed from the quantity of cement to be used, which will be in the neighborhood of 10,000 barrels. The piers are being built by Wm. Sooy Smith & Son, of Chicago, who have been connected with several of the largest works in the country. The design is thought to be peculiarly well adapted to the character of the crossing, and surmounted, as the piers will be, by a correspondingly excellent superstructure, the Yazoo River bridge will be a prominent feature of the new road. The cost of the entire structure is estimated at from $225,000 to $250,000, and when completed will be second to none in the South.

PROPOSED LEAVENWORTH, KAN., BRIDGE.—A bill has been introduced in Congress authorizing the Leavenworth Bridge Company to build a bridge across the Missouri River at Leavenworth.

NEWS OF THE WEEK.

THE COLORED MAN'S RAILWAY.—A very large meeting of colored men from various portions of North Carolina was held at Wilmington recently, to inaugurate the first railroad enterprise ever started exclusively by men of that race. Several thousand dollars were subscribed. The projected road is to run from Wilmington into the eastern counties of North Carolina. There is a strong probability that the road will be built. The movement creates much interest.

THE NEWBURG TUNNEL.—NEWBURG, N. Y., Jan. 18, 1883.—The West Shore Railroad tunnel, several hundred feet long, under the Erie track in the southern boundary of this city, which has been over a year constructing, was finished to-day. Track-laying will begin here next week. It is stated the West Shore Company has made arrangements with the Pennsylvania Railroad Company for the use of the latter's terminal facilities at New York until those of the former are ready. Connection is to be made at the junction of the New Jersey Midland road.

SEDALIA (MO.) WATER-WORKS.—G. B. Simonds, for a number of years Master Mechanic and General Superintendent of the M., K. & T. car shops in that city, presented to the City Council a proposition to take hold of the Sedalia Water-works, furnish them throughout with all necessary new machinery, and furnish the city with a full supply of water for ten years for the sum of $10,000 per annum. The present running expenses of the water-works are about $10,000 per year, and in the past two years the large sum of $15,000 has been expended on additions and repairs. It is quite probable that public sentiment will favor the proposition.

PROPOSED WATER SUPPLY FOR BRADFORD, PA.—Two plans have been submitted by J. Opperman, City Engineer, to the Water Commissioners. Plan "A" includes an impounding reservoir of 5 million gallons capacity, located 43 ft. above, and connected by a 10-in. pipe, with a distributing reservoir; a 14-in. main leads from the last to the head of Main street in the city, 217 ft. below; this represents a static pressure of 94 lbs. per square inch, or deducting friction, 84 lbs. available pressure. The estimated cost of Plan "A" is $58,741.00.

The impounding reservoir in Plan "B" has its high-water level 155 ft. above Main street, distant 3⅛ miles. With a 10-in. main this would give a static pressure of 67 lbs., or deducting friction, 50 lbs. per square inch. To provide for fire service a 10,000-barrel iron tank is located on a hill 260 ft. above Main street, with a 6-in. supply pipe leading to present pump-station, and a 10-in. pipe connecting with 10-in. main now laid on Bushnell street. Plan "B" is to cost $48,553. The distribution system is estimated to cost in addition to either of above plans $63.470.00.

The Holly Manufacturing Co. submitted a proposition to furnish a complete system of water-works for $97,602, including 11 miles pipe and 60 hydrants.

As Mr. Opperman's plans propose 13 miles of pipe and 74 hydrants, the Water Commissioners recommend the adoption of Plan "A" of the latter gentleman, at a total cost of $122,211.

The population of Bradford is put down at 12,000, and 60 gallons per head are allowed them, making the demand on the works, 720,000 gallons per day.

PROPOSED WATER-WORKS AT PORTSMOUTH, VA.—A New York company is about building a complete system of water-works for this city, and for Gosport. The source of supply is Deep Creek, distant 6 miles, and as the country is flat, being nowhere on the line of conduit more than 14 ft. above low tide, two pumping-stations are used. The first, at Deep Creek, is supplied with duplicate Worthington low-service pumps of 1½ million capacity, each raising the water sufficiently to overcome friction in 25,000 lineal ft. of conduit, 24 in. in diameter. This conduit empties into a reservoir near the town, made by damming off the head of a creek, and at this point is located the main pumping station, with two 1½ million Worthington compound pumping engines, delivering the water directly into about 11 miles of distribution. A water tower of a capacity of ½ million gallons will keep the mains full at night, and provide for any sudden fire demands.

Portsmouth has about 12,000 inhabitants, and is growing rapidly as a seaboard shipping point. The present works are designed to supply one million gallons per day. The works were designed and estimates and specifications prepared by Mr. D. Mc. N. Stauffer, Member American Society Civil Engineers, after his own surveys.

NEW AQUEDUCT FOR THIS CITY.—The Mayor has selected five citizens to consult with him regarding the practicability of the plan proposed by the Department of Public Works for building a new aqueduct to supply the city with Croton water. The committee is also to inquire into the probable cost of such an aqueduct and the probable time required for its construction. A report on these points with such other recommendations as the committee may choose to make is to be sent to the Senate within 20 days. The committee consists of Congressman-elect O. B. Potter, Amos F. Eno, William Dowd, John T. Agnew and Hugh N. Camp. The estimated cost of carrying out the plan proposed by the Public Works Commissioner is $14,000,000.

UNION DEPOT AT AUSTIN, TEX.—The city council has passed an ordinance granting the railways the privilege of erecting a union depot.

THE ST. PAUL, MINN., WATER-WORKS.—The water commissioners have authorized City Engineer Rundlett to go East to the large cities and investigate various water-works systems for the purpose of applying the best methods to the St. Paul system. The following cast-iron pipe was contracted for: Twelve thousand ft., with privilege of 20,000 ft., 6-in.; 4,000 ft., with privilege of 5,000 ft., 4-in.; 2,500 ft. 12-in.; 1,700 ft., with privilege of more, 16-in. Contracts were made for fifty iron boxes, with privilege of fifty more.

PROPOSALS FOR BUILDING.—Sealed proposals will be received by Wait & Cutter, No. 7 Exchange Place, Boston, Mass., until Jan. 31, 1883, for furnishing labor and materials for the erection of a library building at Brookfield, Mass.

PHILADELPHIA SEWERS.—Nearly $9[illegible],000 needed for sewer construction.

RAILROAD INCORPORATED.—The Tipton & What Cheer Railroad Company has filed articles of incorporation in Iowa. Capital $750,000.

STEAM PUMPING MACHINERY FOR SALE.—The Board of Water Commissioners of the City of Detroit, Michigan, offer for sale Pumping Machinery used before the erection of their New Works to furnish the water supply of the City of Detroit, viz.: One Horizontal Engine, capable of pumping 4,000,000 gallons in 24 hours; One Horizontal Engine, capable of pumping 6,000,000 gallons in 24 hours; One Vertical Condensing Beam Engine, capable of pumping 16,000,000 gallons in 24 hours. All low pressure. Three Marine and two Stationery Boilers, made of No. 1 charcoal iron. All in good order and for sale on terms advantageous to purchasers. For further information address HENRY STARKEY, Secretary.

A MINNESOTA COMPANY INCORPORATED.—The Winona Railway, Dock & Transportation Company has filed articles. The capital stock is $300,000, and the business which the company purposes doing consists of the construction of railways, branches, side-tracks, etc., in and near Winona, the operation of docks, elevators, etc., the transferring of freights and passengers and the operating of street railway lines in the city. The incorporators are Andrew Hamilton, Verrazano Simpson, W. A. Scott, Charles F. Schroth and O. B. Gould, all of Winona.

LAMPS IN CHICAGO.—The total number of gas lamps in the city is 11,665. The number of gasoline lamps now in use is 2,065. The total average illuminating power is 16.8 candles.

DRAINAGE IN NEW ORLEANS.—The City Council has repealed the ordinance granting privilege to construct pipes for sub-surface drainage to the New Orleans Sewerage and Drainage Company.

ROAD OPENED.—The Delaware, Lackawanna & Western road has been opened to its terminus in Buffalo.

THE NEW MISSOURI PACIFIC DEPOT.—The Dallas, Tex., *Herald* states the supervising architect of this road has made a contract with A. Brownlee for the foundation work on the new depot to be erected at that place. Operation will begin immediately.

BRIDGES OVER THE OHIO.—A bill has been re-reported to the Senate from the Committee on Commerce to amend the act of 1872, so that every bridge hereafter erected across the river shall have its axis at right angles to the current at all stages, and all its spans shall be "through" spans. It further provides that every such bridge shall have at least one channel span placed over that part of the river usually run by descending coal flats, to give a water way of 500 feet, the span to be at least 40 feet above high water mark, and at least 90 feet above low water in the bridges above the mouth of the Big Sandy and 100 feet below that point, and that bridges below Cincinnati shall have in addition a pivot-draw, giving two openings 160 feet each. The bill has already passed the house.

SUEZ CANAL ENLARGEMENT.—The arrangement under which the Suez Canal Company is now governed is what is called the Treaty of Peace signed in 1876, by Colonel Stokes on behalf of the British Government, and by M. de Lesseps on the company's part. One of the obligations of the Canal Company under this treaty was to expend one million of francs per annum for thirty years, to the improvements which might be deemed necessary in the interest of commerce. This had been done

for part of the past six years, when M. de Lesseps asked the shareholders for the privilege of spending the thirty millions by degees as should be necessary instead of one million per year. The shareholders accepted the proposal, and the company's engineers set to work to prepare a scheme of improvement for meeting the eventuality of a doubling of the traffic—viz., twelve million tons instead of six. At present there are fourteen points where one vessel can stop in order to allow another to pass; for two ships in motion are never allowed to pass each other, and unless there were such a prohibition canal-going ships could never be insured. As, however, these stations, or shunting places, only hold five or six ships, there is necessarily a loss of time, of which captains complain; for the rule is that the ship nearest the station must wait for the other to pass. Even at the two extremities captains have sometimes to wait a long time for their turns to enter. It was therefore thought that this question should be considered; and it was decided that three great stations should be constructed, forty kilomètres square, in which a whole fleet of fifty or sixty vessels might anchor. These three great stations will be constructed at Cantara, Timsah, and at a point at present known by the name of Kilometric Station 133. Of course, the stations at present used will continue to exist.

The English directors have approved the plans of these improvements, also those of a new dock at Port Said and for a more effective lighting of the canal. The projected improvements are further designed with the view of again doubling the capacity of the canal, and pending the final approval of everything proposed the plant has been ordered, among which occurs one item of five millions of francs for dredges, which are now being constructed. The sum remaining to be spent is 23,000,000 francs.

DELAWARE RIVER & LANCASTER RAILROAD COMPANY.—It is expected that within a month this company will commence to break ground upon their line of road. A number of contracts have been made for grading.

THE BRIDGETON AND SACO RIVER RAILROAD.—It is expected that this 2 ft. gauge R. R. will be completed and opened to the public about the 15th of January. The road, which is the third narrow-gauge project of Mr. George E. Mansfield, the originator of the Bedford & Billerica and the Sandy River Railroad, is sixteen miles in length, and it runs from Hiram Junction on the Portland & Ogdensburg Railroad to Bridgeton, passing through portions of Sebago and Denmark. It is said to be the only first-class two-feet gauge railroad in the world which has safety guards so arranged that the cars cannot leave the rails. It is built with 30-pound steel rails of the Cambria pattern, and is at present equipped with two rich olive-colored passenger cars named Pondicherry and Mt. Pleasant. These cars have thirty-six seats, which are nicely upholstered, being built by the Laconia (N. H.) Car Company, and finished in mahogany. Between the flooring of these cars there is a depth of 3 ft. of mineral wool, which is used to deaden the sound and keep the cold air out. The passenger cars are 46 ft. and 3 in. long, the inside height being 7 ft. and 8 in. There are Miller platform and vacuum brakes on these cars. They are heated by hot air, and perfectly ventilated. There are mail, express and baggage cars and one combination car, 30 ft. long, consisting of a dining-room, parlor and kitchen. The road has 15 freight cars, which are 26 ft. long. There are two spark-arrester and coal-burning locomotives, which are fine engines. The road has 3 hand and 3 push cars, and in the spring it is intended to increase the rolling-stock. Wm. F. Perry, of Bridgeton, is President, and George E. Mansfield is Superintendent. M. M. Caswell, of Bridgeton, is Master Mechanic, and Stephen L. Stevenson, of Bridgeton, is Chief Engineer of the road. Mr. Mansfield is very enthusiastic relative to the ultimate success of narrow-guage railroads in this country.—*Boston Herald.*

A VERY ANGRY CONTRACTOR.—A Texas contractor is in Washington with a decided grievance and his cup brimming over with wrath, and proposes to make matters decidedly interesting for some one as soon as he can find out who has wronged him. He is Mr. Wm. H. Adams, formerly of New Jersey, who has recently been given the contract to build the projected Texas & Mexican Air-Line Railroad from Galveston to Eagle Pass on the Upper Rio Grande. Last summer he was a bidder for the Potomac Flats improvement, for which Congress at the last session provided $4,000,000, and when the proposals were read he was found to be the lowest bidder, and at prices that made the aggregate many thousand dollars below the next lowest bidder. After many delays Col. Hains, the army engineer in charge, concluded that Adams was not a responsible bidder, and by authority of Secretary of War Lincoln, he was refused the contract which was given to another New Jersey man. Adams is now informed that some one told Secretary Lincoln that he (Adams) was not a bona fide bidder, but one of the straw variety, and was paid a large amount of money by the contractor to stay out of the way. He says that if Secretary Lincoln fails to give him the name of the writer of such charges he will make it warm for the War Secretary.—*St. Louis Globe Democrat.*

WESTINGHOUSE AIR BRAKE.—Aug. 16, 1872, Vol. XIV., *Engineering*, page 118, experiments with Westinghouse Air Brake upon South Eastern Railway, Aug. 15, 1872: The experimental train consisted of engine, tender and six carriages, brakes applied to driving wheels of engine and to each wheel of the train. The brake was first put on at a turn when the speed was 30 miles an hour, and the train was stopped in 18 seconds, and in a distance of 149 yards, up a gradient of 1 in 142. The second stop was made on a rising gradient of 1 in 130, the speed being 30 miles an hour. In this case the time taken in arresting movement was 16 seconds, and the distance 107 yards. The speed of the train was 55 miles per hour when the third stop was made in a falling gradient of 1 in 120, the time required from the movement of applying the brake to stopping the train being 32 seconds. On the fourth and last occasion the speed of the engine had been increased to about 60 miles an hour at moment of putting on brakes and the train was stopped in 400 yards on tolerably level road.

On the Pittsburgh Division of Pennsylvania Railroad in the first year of application of Westinghouse brake, 52 wheels less were removed from 5 cars than under former system of hand brake. These 52 wheels represented in cost and labor $1,255 and were worth at end of year $429, effecting a saving of $826.

The Westinghouse air brake is described in pages 344-346, Vol. XIII. *Engineering*, May 24, 1872, showing several trials on Caledonian Railway between Glasgow and Wemyss Bay, March 21, 1872.

PROPOSED CANAL IN MASSACHUSETTS.—SANDWICH, Mass., Jan. 15.—Messrs. Titcomb & Fox have been in town for the past two or three days surveying the proposed canal route through North Sandwich, Monument and Buzzard's Bay.

A SHIP CANAL ACROSS FLORIDA.—A dispatch from Tallahassee says: A bill was introduced in the Assembly incorporating the Florida Ship Canal Company, contemplating the construction of a ship canal from the Atlantic to the Gulf of Mexico, across the peninsula. The bill names among other incorporators, Townsend Cox, Wm. Fullerton, Wm. Lawson, S. T. Meyers, Michael Jacobs and David McAdams, of New York; Simon Cameron, of Pennsylvania; John C. Brown, of Tennessee; Wm. E. Cameron, A.W. Jones, of Virginia; Benjamin F. Butler, of Massachusetts, and W. H. Manning, of Ohio. There is a powerful syndicate of the promoters of the measure here, and are claimed to represent ample capital. The capital stock is fixed at not less than $40,000,000 nor more than $60,000,000. The bill grants the right of way through and the right to acquire public lands under the existing laws.

AN ILLINOIS ROAD.—The Engineer corps of the Kaskaskia River, St. Elmo and Southern Railway have just completed the survey of their road north to Stewardson, in Shelby County. They have now 124 miles of line located and profile of same completed. Also the right of way of sixty miles secured either by deeds or bonds. The company intend getting eighty miles of the line ready for letting contracts, for grading and building by May. This line, composing eighty miles, begins at Stewardson, goes through St. Elmo, Kinmundy, Salem and Mt. Vernon, Ill., and as soon as practicable the company intends building the road south to some point on the Ohio River.

ARTESIAN WELLS.—The *Times* of Bath, Maine, says: "Not a single artesian well, we are assured, out of the fifty and more that have been drilled in this vicinity has failed in a liberal supply of water, and the capacity has undoubtedly been taxed to the utmost since June last. Some of these are now supplying demands that no other sources could have possibly complied with."

NEW GAS COMPANY.—The Omaha, Neb., council has granted a franchise to a new gas company under a $10,000 forfeit for non-fulfillment of contract.

RAILROAD BUILDING IN THE NORTHWEST.—The Northern Pacific Railway company, having secured nearly all the right of way over the surveyed route, are beginning preparations to build the line from Portland to Kalama. This will connect the entire system of railways in Oregon and Washington Territory with Puget Sound.

STREET LIGHTS.—The city of Wilkesbarre, Pa., is clamoring for improved street lights.

NEW MASSACHUSETTS RAILROAD.—The New York & Boston Inland Railroad Company has received a charter from the railroad commissioners.

NO WATER-WORKS FOR GLOUCESTER CITY, N.J.—The Chancellor of New Jersey has rendered a decision at Camden making permanent the injunction restraining the authorities of Gloucester City, N. J., from building water-works. Sixty thousand dollars in bonds have been issued and sold, and the Council authorized the issue of $40,000 more to raise money to build the works. Contracts for their construction amounting to $102,000 have been awarded.

NEW RAILROADS IN SOUTH CAROLINA.—At the recent session of the Legislature eight railroad charters were granted. The Palmetto Railroad is to be constructed from a point on the North Carolina line through the corporate limits of Cheraw, Camden, Columbia and Aiken to a point on the Georgia line in Aiken or Edgefield counties. The capital stock of the company is fixed at $400,000, in shares of $100 each, with the privilege of increasing the same to $5,000,000. The Union, Gaffney City & Rutherfordton Railroad has had its charter renewed and amended so that the construction of the road shall be commenced in six years. The most important corporation chartered is the Greenville & Port Royal Railroad Company, to build to connect the two points named in the title. There are strong capitalists behind the scheme and the road will be built and operated as an investment. The capital stock is $1,000,000, with the privilege of increasing it to three times that amount. Port Royal finds another converging line in the Spartanburg, Aiken & Port Royal Railroad Company, extending from the city of Spartanburg, in Spartanburg County, to Port Royal by the most feasible route. The capital stock of the company is fixed at $1,000,000, in shares of $100 each. The Mount Pleasant, Santee & Little River Railroad will find an outlet at Charleston. The route will be through Christ Church and St. James Santee parishes, in Berkley County, to the Santee River and thence to Little River, the road to be connected with the city of Charleston by ferry. The Bishopville Railroad Company has been chartered for the purpose of establishing a railroad from Bishopville, in Sumter County, to some point on the Wilmington, Columbia & Augusta Railroad. They also have the power to extend the road to "some point on the line dividing the state of North and South Carolina, and between Lynch's River and Wateree River." The capital stock of the company is fixed at $35,000, in shares of $50 each, with the privilege of increasing it. The Barnwell Railway has the right to establish and operate a railway from the town of Blackville to Barnwell Court House, with power to extend the same to any point beyond the town of Barnwell and to the Savannah River, and from the town of Blackville to Sumpter or any intermediate point. The capital stock of the company is fixed at $100,000, with the privilege of increasing.

The Green Pond, Waterboro & Branchville Railway Company was chartered to construct and operate a railroad from Green Pond depot, in Colleton County, a station on the Charleston and Savannah Railway, to Walterboro, along the present mail route, and over the road known as the "New road," and thence to Branchville, in Orangeburg, along such route as the corporators may select. The capital stock of the company is fixed at $100,000, with the power of increasing it to an amount not to exceed $1,000,000.

The most active company is the Carolina, Cumberland Gap & Chicago Railroad, which has already given out contracts for grading on what they propose making the Great Southern Trunk Line to the West. There are other franchises issued to smaller corporations for constructing branch roads and feeders, and if only one-half of the companies organize "Old Carolina" will be one of the most active railroading sections during the next five years.

BROOKLYN WATER SUPPLY.—Under this head Mayor Low says that the year 1882 has made valuable contributions to the above city's water-works, and that the Common Council have authorized: 1. The construction of new pumping engines at Ridgewood, with a capacity of 15,000,000 gallons daily. 2. An extension of our water supply through a system of driven wells between East New York and Jamaica, under a contract to furnish 5,000,000 gallons daily. 3. The laying of a 36-inch main from the Ridgewood reservoir to the Eastern District of the city. The estimated cost of each improvement, for which bonds may be issued, is $662,500. Continuing, the Mayor remarks: "In this connection it seems to me that the Chief Engineer of the city, Mr. Van Buren, is entitled to much praise. Assuming that the driven wells are successful, which I see no reason to doubt, he will have increased the water supply of the city within the last three years to the extent of 12,000,000 gallons daily at a cost of $300,000. When it is considered that this quantity is one-third of our whole supply, and that our water debt is nearly $10,000,000, the extent of this achievment is better understood. The salary of the gentleman who has accomplished this for Brooklyn has been $3,000 per annum. I believe it would be in accordance with good business principles to make it $5,000."